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CONTENTS FOR JULY, 1925

No. 1

THE U. S. S. SARATOGA	<i>Frontispiece</i>
THE HAWAIIAN MANEUVERS	Brigadier General R. P. Davis 1
OUTGUESSING THE INSTRUCTOR	Major P. D. Bunker 5
PROBLEMS FOR THE COAST ARTILLERYMAN WITH SUGGESTIONS	Captain H. H. Blackwell 17
THE DECISION TO DEFEND KUT-EL-AMARAH	Major E. W. C. Sandes 34
EDITORIALS	46
THE U. S. S. SARATOGA—THE MESOPOTAMIA CAMPAIGN—DEFENDING WAR— THE REGULARS ARE COMING—BATTLESHIP ANNIHILATORS.	
PROFESSIONAL NOTES	53
GENERAL HINES ON THE HAWAIIAN MANEUVERS	53
U. S. FLEET SUBMARINE V-1	56
THE COAST ARTILLERY CORPS AND ITS RELATION TO OTHER BRANCHES	57
Brigadier General H. D. Todd, Jr.	
RATING COAST ARTILLERY BATTERIES	1st Lieut. C. E. Brand 59
THE HUMAN ELEMENT VS. MECHANICAL DEVICES	62
THE MYSTERIOUS WEAPON	Lieut. Col. Weston Jenkins 63
SMALL ARMS TARGET PRACTICE, 1924	65
FORT H. G. WRIGHT, N. Y.	Captain F. S. Swett 66
COMMAND QUALITIES	68
BRIEF DESCRIPTION OF SIGNAL CORPS DEVELOPMENT PROJECTS	70
Major L. C. Bender	
HISTORY REPEATS	74
A COURAGEOUS ACTION	75
MILITARY NOTES	76
FRENCH AND SPANISH MILITARY ORGANIZATIONS IN MOROCCO—AIR STRENGTH OF POWERS—MILITARY TRAINING IN JAPAN'S PUBLIC SCHOOLS—REDUCTION OF NUMBERS OF JAPANESE DIVISIONS.	
COAST ARTILLERY BOARD NOTES	84
BOOK REVIEWS	94
THE CAMPAIGN IN MESOPOTAMIA—THE CONSTITUTION OF THE UNITED STATES—FRUIT OF THE FAMILY TREE—WILLIAM CRAWFORD GORGAS—THE PROFESSION OF ARMS—TALKING WELL.	

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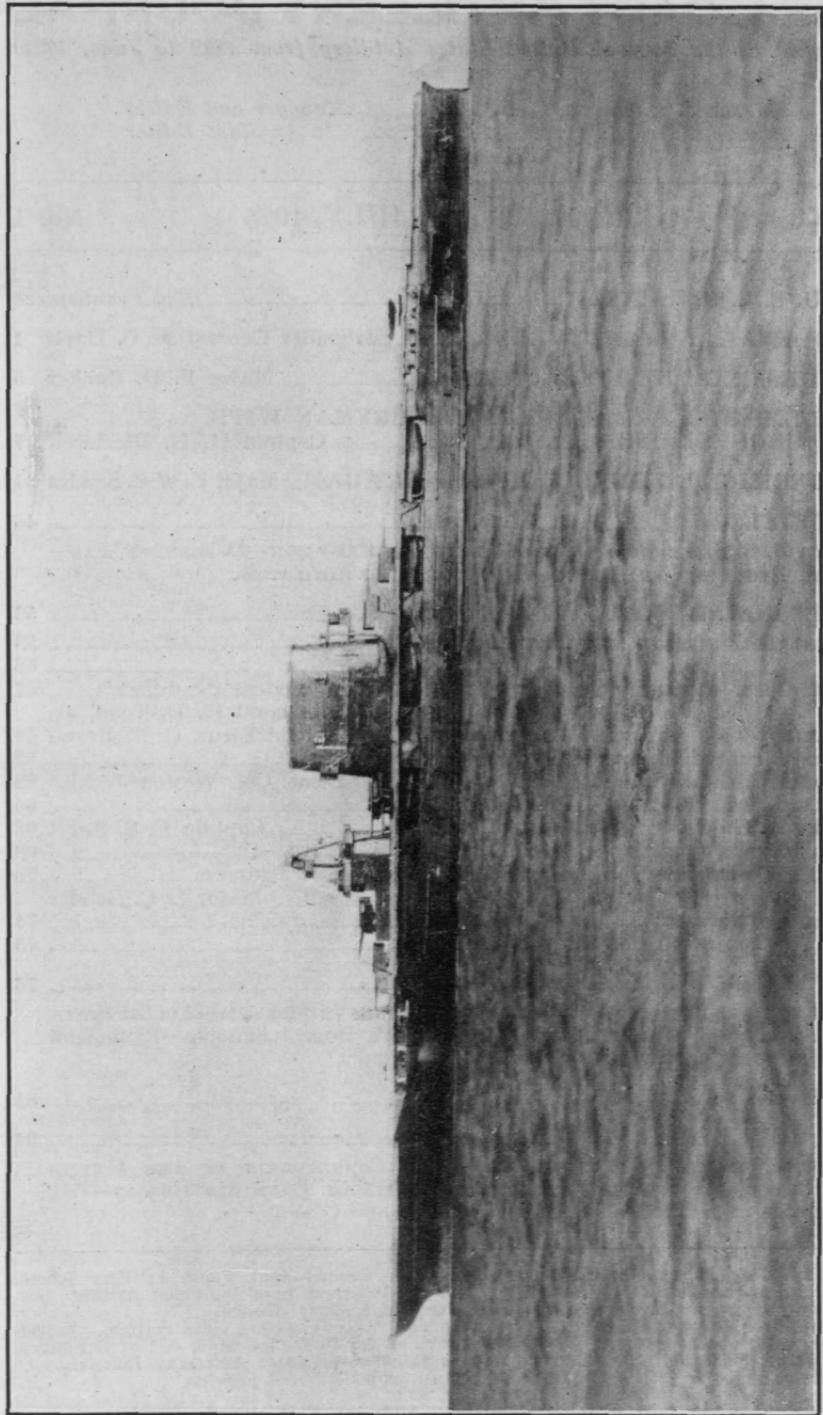
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THE U. S. S. SARATOGA

A photograph of a model showing the vessel about as it will appear when placed in commission in 1926. (For description see Editorial Page.)

THE COAST ARTILLERY JOURNAL

VOL. 63

JULY, 1925

NO. 1

The Hawaiian Maneuvers

By BRIGADIER GENERAL RICHMOND P. DAVIS, U. S. Army

EDITOR'S NOTE: General Davis commands the Hawaiian Separate Coast Artillery Brigade. The following letter was written by him in response to a request for information relating to the part the Coast Artillery took during the joint exercises. General Davis was greatly restricted in the scope of his letter, for, as he states, "an article would involve of necessity much that could not be published."

THE mission of the Coast Artillery was to attack enemy vessels, to protect by fire the land utilities, to support by fire the mobile forces, and to cooperate with the 14th Naval District in the defense.

As we were confronted with the proposition that we did not have enough men to man all the armament, the important decision was to distribute the men with a view to getting maximum efficiency. This was accomplished by manning all observation and fire control stations, all searchlights, and the most important armament.

The armament not manned was designated as alternate armament and armament in reserve—the alternate armament to be manned in lieu of the primary assignment of any unit in the event that the action took a turn calling for minor rather than major armament.

You will see readily that the scheme made the maximum use of the personnel.

Our plan of action involved the standard tactical principles applicable to the operation of coast artillery units and to all situations. They may be enunciated under the following headings:

- (1) Maintenance of constant and close observation.
- (2) Maintenance of close liaison with the Naval District and adjoining units, and the establishment of challenging stations.
- (3) Organization of forts against a land attack, holding under fire enemy troops attempting to land and meeting them on the beach with the bayonet in the event of a landing. Counter attacking in case of a foothold.
- (4) Attack of battleships when within range. Fire very deliberate for extreme ranges.
- (5) Attack of cruisers within range. Fire as for battleships.
- (6) Attack of mine sweepers whenever near mine fields or within effective range—mine layers whenever within range.

(7) Attack of destroyers when attempting a smoke screen or when within range to be effective themselves.

(8) Attack of submarines when within effective range.

(9) Use of searchlights intermittently.

(10) Conservation of ammunition.

In order to have the highest possible state of efficiency at the time of the exercises it was necessary to begin early with conferences involving the probable operations of the Blue and Black Forces.

Committees representing the Blue and Black Forces were organized in each coast defense to draw up estimates of the situation, and orders covering the probable phases of attack. The results of their labors were presented at conferences at which all coast artillery officers were present and extended discussions were held. These studies and conferences were very valuable both for instruction purposes generally and for preparation in connection with these exercises in particular. It is worthy of note in this connection that one of these committees at Fort Kamehameha outlined in detail all the features of the Blue attack both as to time and place.

On the basis of these discussions tactical exercises were held, both on our war game board and with the troops in their battle positions. Thus we were prepared fully for the exercise when the time arrived.

Things worked according to schedule and the developments were entirely satisfactory. We put in stations and established our fire control system in such a way as to eradicate certain dead angles that were supposed to exist, and the units operated in all particulars in a highly satisfactory manner.

Close liaison existed with the adjoining units, and the communications were all that could be desired.

An item of very extreme interest is that ships were picked up and identified at 20,000 yards and followed several thousand yards on their course before they were lost. There are various other items which may not be mentioned but are of interest.

To sum up both in their preparation and execution, these exercises were the most valuable that I have ever experienced and I believe them to be the best military exercise of any character which has been held by any of our national defense forces.

Some of the coast artillery units were with other commands—how they performed may be judged from the following quotations:

“Now that the Joint Army and Navy Maneuvers are over, I wish to record in this official way my high appreciation of the splendid work performed by you and by the batteries which formed the Battle Command. The success of these exercises resulted very

largely, in my opinion, from the immense amount of work which was done in preparation for them. Never did officers and enlisted men take a keener or more active interest in a military problem. The maneuvers involved a great deal of very hard work, but your officers and men went about it as if they enjoyed every item of it. The result was a complete success. Will you please inform the personnel of the batteries which formed your command how highly their work was appreciated by every superior who had the opportunity to observe it."

"Please accept my congratulations upon the efficient manner in which your command performed their missions during the recent Joint Army and Navy Exercises."

"The enemy information you furnished was prompt enough to be of great value."

And then again service of one of the coast artillery units in connection with a regiment of another branch should be of interest as illustrating an example well worthy of emulation at all times.

"The assistance rendered by officers and men of your command to the _____ Infantry in preparation for and during the period of our recent encampment on your target range, is thoroughly appreciated by this regiment. Prior to our arrival, you cleared a large amount of ground; when trucks of our advance detachment became bogged in wet ground, you extricated them with your tractors; you strengthened our system of water supply by the loan of your water carts, and in short, cooperated with us in every way. On behalf of the officers and men of the regiment, I thank you for this fine co-operation, which rendered easy what would otherwise have been a difficult problem."

Another example of the good relations existing between the troops and civilians during the maneuvers is illustrated in the following:

"We wish to take occasion to compliment the Hawaiian Department of the U. S. Army for the attitude, during the recent maneuvers, of the units in the field in that section of the country where we are operating.

"We are frank to admit that past experience had led us to anticipate a certain amount of friction with these units, as well as expect that considerable damage would be done in our fields. The

least we can say is that we were very pleasantly surprised. The courteous attitude of your officers in arranging for placing of telephone and telegraph wires, locating camps, using roads, as well as the behavior of the men camped on or near our property, left nothing to be desired from a standpoint of pleasant relations between the Army and ourselves.

“As we are quick to make complaints when we feel that our rights have been trespassed upon, we wish also to be as quick in expressing our satisfaction over the pleasant contact during the past few weeks.”

The Department Commander expressed his views in the following:

“The Department Commander desires to express sincere appreciation of the excellent conduct, the keen interest and the high efficiency of the personnel of your command during the recent Joint Army-Navy Exercise. It is gratifying to him to inform you that all observers, civilians, officers of the Navy, and Umpires, concur in commendatory comments upon the high standard of conduct, training and morale of the personnel of the Hawaiian Department.

“The Department Commander, knowing that the success of the Exercise was largely attributable to the zeal, efficiency and morale of the rank and file of the Hawaiian Department, desires to commend especially such personnel therefor.”



Outguessing the Instructor

By MAJOR P. D. BUNKER, C. A. C.

“Have you guessed the riddle yet?” the Hatter said, turning to Alice again.
“No, I give it up,” Alice replied. “What’s the answer?”
“I haven’t the slightest idea,” said the Hatter.
“Nor I,” said the March Hare.

LEWIS CARROLL.

IN THE dim and distant past when I was a boy, we had a game of marbles known as “odds ‘n’ evens.” It was a great game. You held in your closed hand or hands a certain number of marbles and rattled them as alluringly and deceptively as might be. The party of the second part was supposed to guess whether the number of marbles so concealed was odd or even. If he guessed right, he won the handful for his own, in fee simple; if he guessed wrong he gave you as many marbles as you held in the said handful. Observe the beautiful simplicity and fairness of the game! Absolutely no “percentage in favor of the banker,” and your possible gains were in exact proportion to your ventures. If you chose to rattle a large number of marbles (a matter of pure choice) you might win (or lose) that same amount. In other words, you could play as mild or as stiff a game as you pleased. And the chances were precisely even. Show me a game of the “grown-ups” as fair as that!

And yet, mathematically fair as the game was, it quickly developed that a boy’s winnings were in direct proportion to his brain power; you could measure a boy’s intellect almost exactly by the number of marbles he won. (No, Gentle Reader, I made no mention of my own winnings; please don’t interrupt). It worked out something like this: Suppose Tommy Jones held, say, five marbles in his hands and Bill Green guessed there were but four; upon Tommy’s showing the marbles and convincing his opponent of his erroneous judgment the latter would pay Tommy five (count them) five marbles. Whereupon Tommy would start the game anew by concealing another covey of marbles—and right here is where the brains came in. Tommy would size up his opponent in a fashion roughly as follows: “Bill is what the crossword puzzle calls an oaf; he guessed even, last time, and lost; he’ll guess odd this time and expect to win; so I’ll change, too, and hold an even number of mar-

bles this time." Or, if he were up against a brighter boy, Tommy might "estimate the situation" differently, to-wit: "Jack here is not so dumb; he knows I held an odd number of marbles last time and won; he thinks I'll change to an even number this time just to fool him; he's going to try to outguess me by repeating his former guess; so I won't change this time, I'll hold an odd number of marbles again."

For a third "special situation" assume a still wiser opponent, and Tommy's cogitations might assume the following tenor: "Jim is awfully smart, and he knows that I am smart, too; I beat him last time by holding an odd number; he gives me credit for more sense than to merely shift to an even number this next time; he thinks I'll try to double-cross him by sticking to 'odd' expecting him to do the shifting; so he is going to guess 'odd'; I'll hold an even number this time, just the same as if I were up against a regular nitwit."

Let's take no further steps in this analysis of reasoning; its higher complications become embarrassing. The illustration has served its purpose. You see what I mean. The main point is that Tommy Jones has open to him two courses of action—to change or not to change. "In this situation" if Tommy decides to change from odd to even then his opponent loses out, be he stupid or clever; only the mediocre boy would win.

Just another illustration of "outguessing" to clinch the point. This one might be termed an "historical example." It seems that on the American Front near Vieville there was a German heavy battery that was regularly and perniciously active at a certain hour every night. It would fire a rapid and heavy burst and then, when the American heavies would open up in counter-battery, no more would be heard of it until the next night, when it would open fire again as per schedule. By means of sound-ranging this battery was finally spotted as being in the opening between two hills, as indicated in Fig. 1.

When this information was furnished to the Yankee artillery they reacted roughly (sic) as follows: "Aha!" said they, "we know what Fritz is up to now. He runs his guns in there on those two tracks every night, gives us a few salvos and then beats it back over the railroad to the rear areas. We'll teach him a new one! Wait till he opens up tonight and we'll put a sweet concentration of fire on that switch just about the time his guns get on their way to the rear. Let's see how he will laugh *that* off."

The idea seemed to have much to recommend it. The performance was staged that night exactly as planned and, after it was over, the Gringos chuckled in high glee to think of the joke they had perpetrated upon the wicked and unsuspecting Boche. But, to their

astonishment, the same German guns opened up again the next night right on the same old schedule, fired their salvos as before, and were treated to another dose of counter-battery and interdiction fire. The succeeding night was the same, and so were the following nights; the Germans seemed to have some weird method of hopping over or around that switch, on their way back. It was not until this terrain came into Allied possession that the puzzle was solved, and the solution was absurdly simple, after all. Contrary to expectations, the German guns were not on railway mounts at all, but were permanently located at "A" (see Fig. 1) about midway between the ends of the two railroad spurs, in carefully concealed emplacements. Incidentally, these emplacements were far enough from the spurs to escape

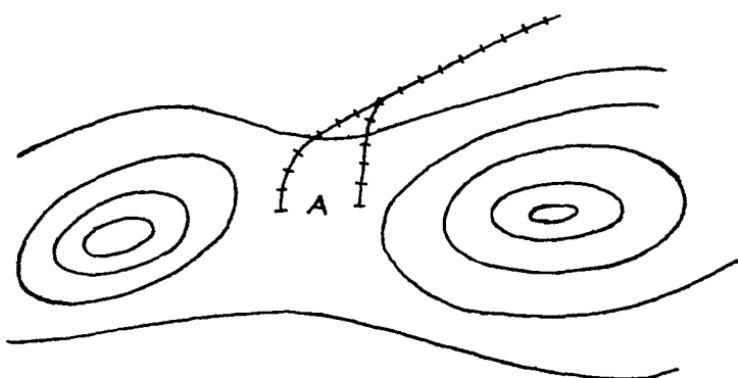


FIG. 1

well aimed shots fired at the latter. As a consequence, the guns of course had no relation whatever to the switch; they fired their nightly allotment and then simply lay doggo until the next night. Conclusions may easily be drawn as to who did the outguessing in this case.

These illustrations have led us (rather neatly, I think) to the title of this theme—"Outguessing the Instructor." But before proceeding further with this topic, let us dilate for a moment on a point or two which may be obscure to those of us who have not, as yet, attended a special or general service school.

In these days of map problems and terrain exercises it is, perhaps, unnecessary to state that the cryptic symbol "CU" is the brand and stigma applied to a solution which ranks, in merit among the lowest of the low (that is, in Grade "C") and, by virtue of the suffix "U", is alleged to be "unsatisfactory." If your paper draws a "C" you may feel properly humiliated, but you do not alto-

gether lose hope of salvation. On the other hand, if your solution draws a "CU" it is as if you missed a six-inch putt on the eighteenth green—can anything be more devastating? I pause for a reply.

The person who marks your paper intends to convey, by means of the aforesaid symbol, the fact that your solution, in his opinion, seems to lack one or more of the elements of Success. In the school with which you may happen to be familiar there is, perhaps, a different system of marking, but it is safe to venture the assertion that it includes a counterpart of the "CU."

So it is to my Fellows of the Humble Order of the CU, my brother Knights Errant in the profession of Map Problem Solution that I bring this message of glad tidings. To them I say, "Be of good cheer; we are not the ivory-domes the instructors think we are; we are simply proving ourselves their mental superiors by outguessing them. Be not dismayed at a solid string of CU's; naught is lost thereby save honors."

Now, let's go into this thing a little more in detail. The first step is to analyze our subject, our *casus belli*. The CU Club would not be misunderstood as thinking that, *ex officio*, every instructor lacks judgment, poise, and a heart. Not so! In our long and checkered careers we have spent perhaps a third of our time under "Instructors" and until the final "Taps" puts a merciful end to their struggles in our behalf we must expect to spend considerable more time in the same way. So "get in bad" before we start? The Club therefore maintains that it is good psychology (and sound strategy) to prevent our instructors-to-be from forming erroneous opinions as to the very high esteem in which the Club holds their abilities, patience, and perseverance against overwhelming odds. Besides, we ourselves might be instructors, some day!

There are those who claim that an officer, upon being detailed as instructor, immediately puts into cold storage his equipment of reasonableness and humanity, if any, wraps about him a cloak of superiority and bigotry and stalks forth to bring dismay and despair to the souls of his erstwhile comrades. This view, of course, is held by the extreme Left Wing only. Until instructors are drawn from a source different from the present one it is evident that they must be of the same clay as the students. Occasionally an instructor may seem to adopt the "holier-than-thou" attitude, but this usually happens only in the case of a comparatively young and inexperienced officer. There are, also instructors who can see nothing but the book solution of a problem; to them any other solution is anathema. Such a frame of mind is indeed unfortunate, not only for the student, but also for the instructor himself.

This attitude may react injuriously on the student in one or more of several ways. In the first place, the student may be a sulphite and not a bromide and his solution, while differing from that in the book, may nevertheless have points of excellence. To assume that there can be no points of excellence except those in the book solution is to assume that the authors have penetrated to the full depth of human knowledge and to be infallible, and that the art of war is an exact science—assumptions that few of us would care to make. Now, if this student's solution, without credit for its intrinsic value, is to be swept into the discard with a summary "CU" simply because it differs from the book solution, the student naturally feels either bewildered or resentful, perhaps both. He may begin to suspect that this particular instructor is so uncertain of his subject that he dares not trust himself away from the book solution. In such a case the student may sooner or later deduce the not unwarranted conclusion that there is but one acceptable solution—the one in the book. He says to himself: "They keep telling us that the book solution is *a* solution and not *the* solution and that most problems have more than one sound solution. But I've noticed that the further you get from *a* solution the lower mark you get. There is something in this Shakespearian quotation about 'Methinks the lady doth protest too much.' Why don't they call it 'THE approved solution' and be done with it?"

It is probable that such a state of mind among the students would be sufficient in itself to kill the prospects of success of any course which was a purely voluntary proposition, that is to say, in National Guard or Organized Reserve circles. It therefore follows that, if the course is to be a success in such cases, the *why* of everything must be shown in clearest terms. Each solution must be treated as a personal matter between the instructor and the student. It will not do to pencil "12" or any other number opposite an alleged error and expect the student to rest satisfied with looking up that number in a List of Comments. He wants *personal* attention, man-to-man stuff, and if he does not get it he may quit the course entirely. He probably figures that he has given of his own spare time to the problem and is entitled to a certain amount of the instructor's time and attention.

So, if a student's solution is found to be defective, one must be extra careful to show the *why* and *how* of the matter; it is not sufficient to say, "This is the right way." If we cannot show conclusively that the student has overlooked or violated some vital principle of war, if he has submitted a solution that is well carried out—even if the decision itself is not of the best—should we not remember the axiom that "A poor decision well carried out will usually win

over an excellent solution poorly executed"? Should we not, in such a case, say, "This appears to be a good solution of the problem"?

Such a concession, even if it happens but rarely, has a wonderfully beneficent effect on the morale of the student. It also has its good effects on the instructor himself. The reverse is also true. If we habitually blind ourselves to everything except the book solution it would seem very easy to build for ourselves a reputation for narrowmindedness that will surely react upon us in the future. Concerning one of the highest type and most efficient officers of our service it is said that one of his principal characteristics is his ability to "see the other fellow's side of the case." Such an officer realizes that to receive and welcome new ideas is to broaden his intellect, even though some of the new ideas are erroneous.

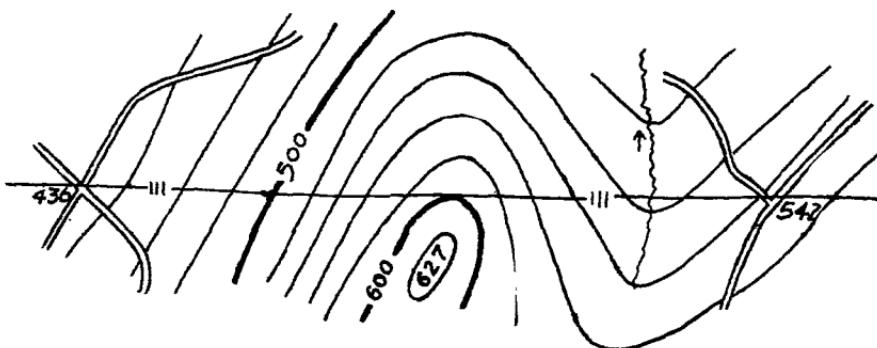


FIG. 2

Luckily, the bigoted instructor seems to be so rare that he is correspondingly conspicuous and, once recognized as such, the student makes allowance accordingly. As a case in point and in deference to the wise saw that an illustration does much to "adorn an otherwise bald and unconvincing narrative," let us cite the situation shown in Fig. 2. This case, by the way, did not arise at any of our service schools. It seems that a boundary between two adjacent units was specified as being, "Crossroads 436—North end of hill 627—roadjunction 542—etc." The point was—exactly where is the north end of hill 627? The north slope seems to be so nearly uniform as to prevent anyone from deciding even approximately where this point is. It was evident, from the context of the solution, that the originator of the problem intended the boundary line to touch the 600-foot contour, an admittedly vague landmark. But due to a slip such as befalls even Jove at times, an unfortunate wording was used, although some easily recognizable landmark

could and probably would have been used if the originator of the problem had been that rare sort of being that never makes a mistake. Of course, this particular error was of negligible importance, and the author of the problem would probably cheerfully admit the mistake and correct it on the spot. And yet, it is said, one officer, acting as instructor, undertook to justify and defend this *lapsus linguae*. Whether or not his efforts were successful can be judged from a subsequent remark by one of his students: "Ye gods! If they would only admit just once that they aren't perfect! I'd go at it then with a new zest and feel that there is some hope for me."

There is another type of instructor who causes considerable demoralization in the ranks of the students. He is the one who deals only in glittering generalities, never allowing himself to be pinned down to definite facts and figures. His pet remark is, "It depends on the situation," which remark, in varied guise, is more ancient than the Golden Fleece. Psychology bids us doubt the justice and soundness of any saying which brings a smile to the lips of the audience; this is a pat illustration. Utter that sentence in the hearing of any number of students and note the reaction. Of course the statement is incontrovertible, but that does not help the student who is looking for some sort of guide through the maze of tactics. For example, a student may want to know in a general way, what frontage a division of the defensive can cover, whether it is one mile or ten. The instructor could answer that "it depends on the situation" and very properly so if the student is looking for a yard-stick to apply indiscriminately to all cases. However, if the instructor refuses to deal with concrete cases at all then the student has no clue as to which of those two limits would be the more nearly correct in any case. Later the same student might find himself severely cut for "over-extension" if he deployed his division on a frontage of over four miles. The point to be made here is that if there are rules which justify "cuts" then it would seem that these same rules are good enough for instruction purposes.

From the foregoing remarks anent a few selected "horrible examples" it should not be thought that instructors constitute a class of disagreeable personages, to be tolerated as a necessary evil. Such is far from the truth; most of them are ready and anxious to work their heads off to help all who ask for assistance. And this is not for the selfish reason that a generally poor showing, by the students, in the problems relating to their (the instructors') subjects tends to show inferiority of instruction rather than inferiority on the part of the students. Moreover, most of them are ready to admit, as the fruit of experience, that a perfect map problem is a very rare bird.

So far, in this paper, we have kept the Instructor under the microscope. Let us now put the Student in the same enviable position. The former has presumably "been through the mill" in some form or other, and hence constitutes a more nearly uniform product than the latter; that is about the only difference. In other matters the characteristics of the two classes are about the same, and inevitably so, since both are drawn from the same great reservoir. There is a difference, however, in their complexes due to the fact that one "hands it out" and the other acts as receiver.

And so we should expect to find about the same proportion of openmindedness in one class as in the other. Most of us are acquainted with the man who says, "Well, they gave me a C on that one, but it looks as though I deserved worse; I missed it by a mile." On the other hand, most of us are also acquainted with one or more of our compadres who would never admit, under any circumstances, that they had made mistakes sufficiently serious to warrant a "CU."

Another type of student is the one who "fights the problem"; he rails against its style, construction, and diction, and attributes his marks (usually low) to the fault of the problem and not to his own errors. He spends so much time in picking flaws in the problem that he has but little time left in which to solve it, and so the last days of that man are worse than the first. There is but one sure cure for such a malady—have him make up a problem himself! After he has worked himself into a lather trying to compose a problem that will at least hold water he will realize that the operation is far more difficult than it looks. Thenceforth he will be decidedly more lenient if not actually indulgent when perusing the efforts of others in this field of endeavor.

It has repeatedly been remarked that officers who are experts in certain lines frequently make poor marks in problems relating to their specialty. It is frequently said that cavalrymen will fess on military problems and then max the infantry problems, that an artilleryman will receive severe cuts on the disposition of his regiments and then carry off the blue ribbon in such a ticklish event as a "position in readiness," incidentally beating out some of his friends in the infantry who, in turn, have just been sunk without a trace but had previously pulled off a highly successful cavalry reconnaissance. And for the other branches, no change.

At first blush this looks queer; but on close scrutiny the abnormality decreases. The whole answer does not lie in the statement that the problem itself is defective although, of course, a certain percentage of them must in all honesty be placed in that category. Map problems are the fruit of human brains and not of divine inspiration, and hence perfection is rarely to be expected. It is be-

lied that the real answer is often to be found in the student himself, especially in the case of map problems which have been promulgated within the last few years. Probably most of these problems were drawn up for the special purpose of illustrating the application of one or more previously selected principles of tactics or of strategy. Sometimes there has been inserted subsidiary conditions—"camouflage," if you wish—so that the application of the principles will not be too staringly obvious. Of a necessity, the problem is written for the average officer, not for the expert; the stated conditions must be suited to their main purpose of educating the *average* student. Herein lies the peril for the expert. The lesson which the problem was designed to teach looks so elemental and obvious to the highly specialized officer that, to him, it looks altogether too easy, and he immediately casts about for the Senegambian in the woodpile. Naturally, in his search, he sooner or later finds some unobtrusive and ostensibly innocent statement in the situation which rouses his suspicions, and this he takes as a new line of departure because he does not want to "jump at the conclusions" indicated by the seemingly too transparent situation. Actually he does jump at conclusions just the same, but in the opposite direction; he jumps at the conclusions which he has deduced from the imaginary joker in the problem. On the other hand, the officer with less expert knowledge accepts the problem as stated on its face; to him the solution does not appear excessively easy or obvious and so he does not pass over the *prima facie* evidence in the case and look for subtleties. He puts all his energies into solving the bald, unadorned situation as it appears to him and, assuming that he has the average good judgment, makes a decidedly better score than his admittedly more brilliant brother of the expert knowledge.

The expert has tried to outguess the instructor in this case and, possibly, has succeeded. But the marks issued for the problem will not console him for that. The non-expert who did the obvious thing and lacked the advantage—or rather disadvantage—of highly specialized knowledge, probably secured the higher mark. Very often, when we receive the approved solution, we recognize it as an old acquaintance; this is because it is a solution which we thought of and almost used, but finally discarded as being too simple. We thought it represented the "odd" guess in the marble game, so we evolved a better (?) solution, guessed "even" and—scored a clean miss.

There is another aspect to this "expert" proposition. Some of our officers acquired a great deal of experience, valuable and otherwise, in the late quarrel with Germany. They saw certain things done in certain ways, and successfully at that. From this

they drew the conclusion that these were the only correct ways of doing these particular things. Whereas it seems generally conceded that many of the things done during the war were done in certain ways because these ways were necessitated by very special circumstances. This leads to the corollary that many things were done in the war in a way that was and is all wrong, a way that should not be used unless other and better methods are prohibited by circumstances. This fact, overlooked by some, leads them into erroneous decisions in the Map Problem Room. They say to themselves, "This is the way we did it in La Belle France"—and they write it down that way. Later they may find out that while that was the way we did it in France, we would do better not to admit it in public.

These two causes, possibly more than any others, would seem to be the bases of the oft-repeated allegations that the more a student knows about a subject the lower will be his marks in that subject—as measured by map problems. Perhaps many of us assiduously keep such allegations alive and cherish the memory of one or more proofs that have come to our ken—all in the spirit with which the little boy whistles in the dark. There's a lot of consolation in it, what?

Upon analysis we might arrive at the opinion that one or both of these "causes" just mentioned may have their root in the spirit of emulation which is such a marked characteristic of the classes at all service schools. This rivalry sometimes approaches in earnestness a real "struggle for existence," an unhealthy intensity caused primarily by placing an exaggerated valuation upon class standing. To quote from the address of the Commandant of the General Service Schools at Fort Leavenworth on September 8, 1924:

Your class standing will be determined solely and entirely by your scholastic work during the ensuing year. No other factors enter.

Your efficiency reports for the nine months ending on June 30 will be based solely and entirely upon your work, conduct and bearing during that period. No other factors enter.

So it is seen that an officer's efficiency report during a school session carries other items beside class standing. The fairness of this is all the more apparent when we reflect that (at least in those service schools with which I happen to be more or less familiar) the only scholastic work for which marks are awarded consist solely and exclusively of map problems—and the closely related subject of Terrain Exercises. As a necessary result, presumably, an officer's standing in the class is measured only by his ability in this comparatively narrow field. To claim that an officer's ability to solve

map problems is a criterion of his general efficiency as an officer would be as logical as to claim that Jack Dempsey must, of course, be a prize-winning pole-vaulter.

That is not to say that ability to solve *sound* map problems and *sound* terrain exercises (after you know the rules of the game) is not indicative of capability for general staff work and for command of *large* units. On the contrary, there seems to be trustworthy evidence that such is indeed the case. But be that as it may, just because an officer makes 90 per cent of "A's" is no reason for assuming that he can train a battalion or administer a regiment or lead a forlorn hope. In fact, the contrary has conclusively been demonstrated in more than one case. The scope of the duties of an officer is too wide and varied to permit such a deduction. This is the reason the CU Club asserts that the man who stands well down in the class should not necessarily feel disheartened on that account. It is said that General Grant was a member of the "goats" when he was graduated from West Point.

If only some means or methods could be evolved whereby the officer's daily work throughout a wide scope could be rated and entered as a factor of his class standing, the resultant figures would more closely measure his general mental (and physical) qualifications and abilities. This must not be construed as a diatribe against "class standing"; perhaps nobody ever stood willingly at the foot of a class. It is intended merely as a reminder to those of us who reap fewer "A's" than we would like, that ability to solve map problems, while an enviable asset, is a gauge which is too narrow to measure our own sterling worth.

But, accepting things as they are (and they are in as good shape almost, as we ourselves could arrange) our standing is a result of map problem and terrain exercise work alone; they are the things that count, and so the student can hardly be blamed for striving, tooth and nail, for the highest obtainable mark in those subjects. Personally, we may prefer to spend our few leisure moments in fruitless endeavors to cure an execrable "slice" or in researches concerning a three-letter word meaning "island," but that does not license us to criticize the other fellow for preferring to spend his time delving in last year's problems. Rivalry is an inevitable result of the system as it would be, probably, of any system that could be devised. And, kept within healthy bounds, I know of no one who deprecates its existence.

In this rivalry, however, there are a few facts which we should keep constantly in view. The first is that the map problem itself is not one of our rivals; nothing can be gained and much may be lost by "fighting" it. Map problems originating at the General Service

Schools, at least, must be "guessed right" by three separate officers working independently for the solution, before the problem is ever approved for issue. The second fact to be remembered is that the instructor, likewise, is absent from our list of rivals. Let us then give over our attempts to outguess him. In the first place, it can't be done; he is on the right side of the book. In the second place, even if we *do* outguess him he should worry; we are on the receiving end and not he. The only safe method is to take the problem as it is, in all its horrible details, treat it like any other puzzle, strive for a common-sense solution that will hold water—and let the CU's fall where they may.

An individual instance of the failure of wartime experience to measure up to the roseeate promises of today is that of the *Konigsberg*. When raiding activities could no longer be maintained this cruiser was marooned in a shallow river in German East Africa. Here she lay, as helpless as a target ship, with the one exception that she had her antiaircraft guns. The British brought down two seaplanes to bomb her. In the face of the antiaircraft fire they proved unequal to the task. After several attempts one of them crashed into the sea and was wrecked. Then the Admiralty sent down two monitors, and with seaplanes spotting for the indirect fire—just the kind of auxiliary service which all admit is invaluable—the *Konigsberg* was quickly destroyed.—*Lieut. Commander Sidney Ballou in the United States Naval Institute Proceedings.*

Problems for the Coast Artilleryman with Suggestions

By CAPTAIN H. H. BLACKWELL, C. A. C.

THEORY OF ERRORS AND ITS APPLICATION TO CHANGING VALUES

FOR the purpose of this discussion the following classification of errors is made: (a)—Accidental Errors. (b)—Constant Errors. (c)—Variable Errors.

(a) Accidental errors occurring in artillery fire are errors of individual shots as measured from the true center of impact to which no known cause may be assigned. These errors as such are never corrected for. While all methods of adjustment make use of these errors as a basis for correction, yet if they were determined their value would have to be subtracted from the deviations in order to find the necessary correction to apply. For example, suppose a shot struck 200 yards over the target and we knew that the accidental error of that shot was 100 yards over the center of impact, we should obviously know that the center of impact was 100 yards over the target, and correct accordingly. The deductions that may be drawn from the above are that *accidental errors require no correction*, and that if accidental errors can be determined, so as to permit their elimination, adjustment would be a simple matter. If we had only accidental errors to contend with we should need no adjustment. All that should be necessary to know in order to obtain the maximum fire for effect would be the map range to the target, and with a range scale once adjusted at the arsenal the center of impact would always be on the target if its map range were set on the range scale.

(b) Constant errors as classified here refer to those errors which have a constant value and are not affected by changing conditions. For example, errors in the determination of the map range of any particular target, or errors in the computation of the range table, etc. These errors occur to the same extent any time these incorrect values are used. These errors require adjustment, but once corrected for are eliminated. If that were the only kind of error for which we had to correct, adjustment would be very easy. An error of this kind would be detected early in the series, and corrected for,

after which fire for effect may be maintained indefinitely without further need for adjustment.

(c) Variable errors are errors which have a variable value, depending upon changing conditions. These errors are what make the adjustment of fire a problem. They follow no definite law, as in the case of accidental errors, but they have certain characteristics which should be considered in any method of fire adjustment. Were an error of this kind known at all times we could assign it no definite value. However, its value may be indicated by a curve from which a definite error may be determined for any specified time.

This variable error occurs in firing at a stationary target as well as in firing at a moving target, only to a lesser degree. We have no means of absolutely separating this kind of error from the others in order to study its characteristics, but we can reasonably assume that a curve of ballistic corrections as plotted on the time range board with our present system of fire control for guns is representative of this error. The chief characteristics of this curve are that it has no sharp breaks, and it is possible to predict thereon for the value of future corrections.

In our text books on gunnery we are told that "errors" refer only to the deviations from the center of impact, and the deviations from the target are not "errors" but "deviations." In this discussion, no such distinction is made, the deviation of the shot from the target being the total error of that shot, which may be caused by any of the above classes of errors or any combination thereof. Since the true center of impact is kept near the target, with any good method of adjustment, we should consider the deviations from the target as deviations from the true center of impact, or "errors." If the probable error of the armament is known the accuracy of the above assumption, as well as the efficiency of adjustment, may be readily ascertained by the relation of the armament probable error to the developed probable error.

If the probable armament error is 100 yards, and in firing a series of shots we develop a probable error of only 100 yards (deviation from the target taken as errors) then the efficiency of adjustment is 100%. But suppose we developed a probable error of 150 yards, then the efficiency of adjustment would be 100-150, or 66-2/3%. As a further illustration of the comparative value of this test of efficiency let us assume a condition where an error exists at the beginning of a shoot of minus 100 yards and at the conclusion this error was plus 100 yards, this error being a variable error. If no corrections were made and the accidental errors followed the law of probability the center of impact of the series would have been on the target and according to our present method of analysis would

indicate perfect adjustment. But if the developed probable error were computed it would be found to greatly exceed the armament probable error, indicating the lack of proper adjustment. The problem of adjustment is not so much a matter of keeping the center of impact on the target as it is of keeping the dispersion from the target a minimum. If the latter is accomplished the former will of necessity result; a relation which does not exist conversely.

To correctly apply the theory of errors to the adjustment of fire at a moving target two considerations are fundamental: 1st, we must consider our "yardstick," or unit of measure, and 2nd, we must consider the quantity or distance to be measured. Our measuring instrument is the elevation, or range scale on the gun itself, and the quantity to be measured is not the actual distance to the target, nor the true center of impact of the gun, but the angle of elevation necessary in order to hit the target. This value is otherwise known as the ballistic range of the target. The range table, for convenience, assign certain values in yards of range for corresponding elevations which are true only under certain conditions.

The point that the artilleryman must keep in mind is that the ballistic range to the target is always the unknown quantity, and can not be determined from the map range with a great degree of accuracy, even though the latter may be accurately determined. The problem of adjustment of fire consists, first, in measuring the ballistic range to the target using the gun as a "yardstick," and second, in setting the gun at this ballistic range.

The use of "ballistic range to the target" as the unknown quantity, instead of "true center of impact of the gun" is the key to the proper application of the theory of errors to adjustment of fire on a moving target.

As an illustration, let us consider the following problem: the target is stationary, at a distance of 10,000 yards from the gun; find the ballistic range to the target.

The approximate ballistic range for the 1st shot is computed from the map range with corrections for any known abnormal conditions affecting the flight of the projectile. The first value is, at best, only an estimate of the ballistic range of the target. Suppose the value thus determined to be 10,200 yards. If this shot falls 100 yards short then the ballistic range of the target as shown by this one measurement is 100 yards more than the ballistic range of this shot, or 10,300 yards. If three more shots were fired at the same elevation as the first with the following deviations from the target; 200 short, 50 over, and 150 short, respectively, then we would have the following measurement of the ballistic range of target: 10,300, 10,400, 10,150, and 10,350, or a mean value of 10,300.

The difference between this method and the one commonly used lies in the fact that the distance between target and splash is referred to in the one case as deviations of the *target* from the *splash* and in the other as the deviations of the *splash* from the *target*. It is more logical to go from the known to the unknown. The ballistic range of the splash is always known from the moment the shot is fired.

If the ballistic range of any particular target were a fixed quantity, then the mean of the measurements of this quantity as determined above would give a value for the ballistic range of the target, the precision of which value being in direct proportion to the square root of the number of measurements. Adjustment in this case would be a comparatively easy matter. It is unfortunate, however, that, even in the case of a stationary target, this unknown quantity, the ballistic range, is not a fixed quantity, but a variable quantity, changing in value momentarily. In case of adjustment on a stationary target this variation may be ignored without appreciable error, provided the series of measurements cover a short period of time. But as long as we ignore this condition in the adjustment of fire on a moving target, so long will we be without any effective method of adjustment. The problem that presents itself is a means of determining a variable quantity from a number of observations and applying the theory of errors thereto in such a manner that a mean value of this quantity may be known for any particular time.

All text books on the theory of error treat this subject in its application to the measurements of fixed quantities, and it becomes necessary for the artillery to develop practically a new science in order to apply the same principles to the measurement of changing values. The fundamental difference is a mathematical difference between a *point* and a *curve*. If the true value of the ballistic range of the target were known at short successive intervals of time, and these values plotted as ordinates and the time intervals as abscissae we should obtain a curve which by interpolation would give us any of the values for the range for any particular moment covered by the series of observations. The most important characteristic of this curve is that of continuity, its range value being solely a function of time.

In the case of adjustment on moving targets the theory that the arithmetic mean of a number of observations is the most probable value is a fallacy; the most probable value may be indicated by a time differential curve drawn on a time range board so as to assign a minimum value to the sum of the squares of the residual errors when the observations are plotted on a time range basis. A mathematical consideration of this theory is very difficult, and for that reason will not be undertaken in this discussion. However, a graphic

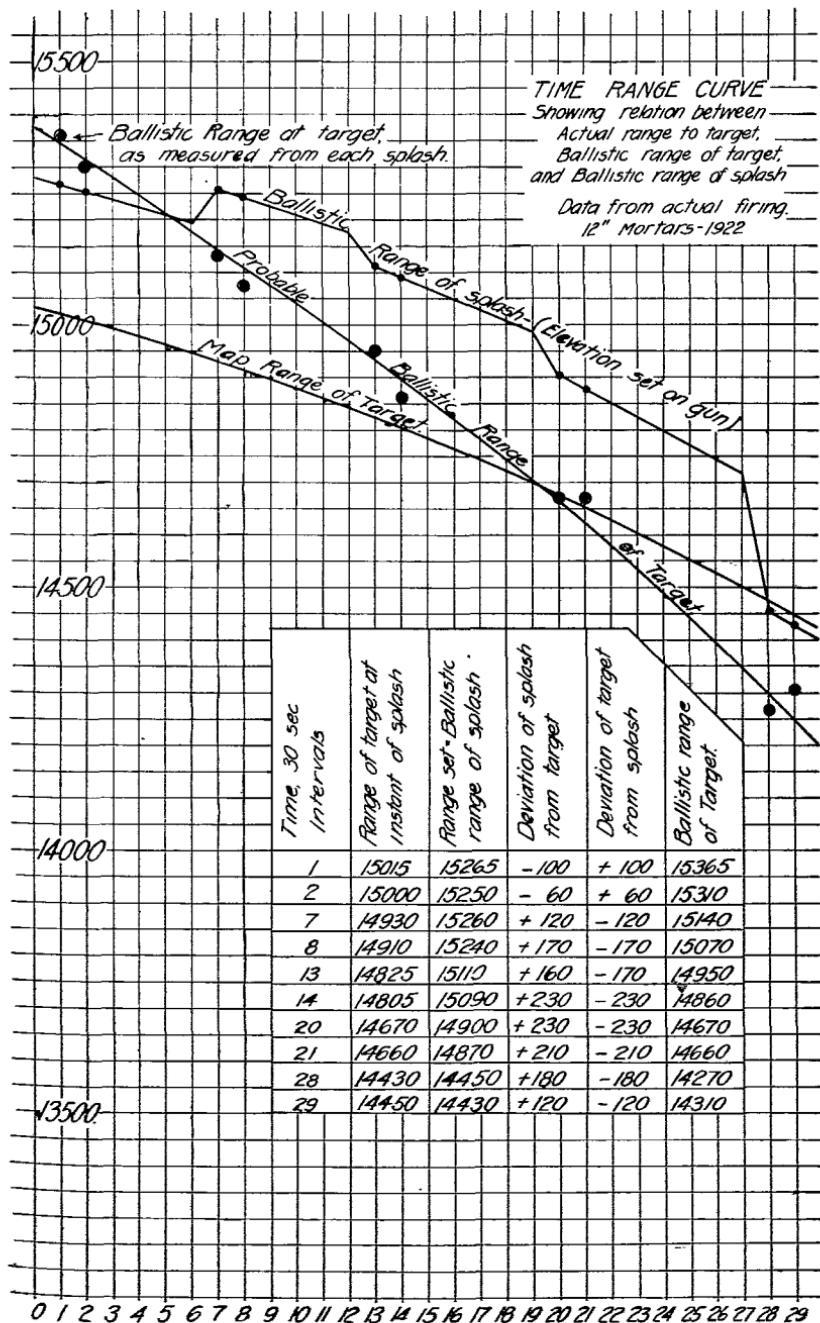


FIG. 1

solution is very simple and for all practical purposes is accurate enough. We should proceed as follows: On a time range board plot the ballistic range of each shot as soon as the gun is fired. When the observation of the splash is obtained plot the ballistic range of the target by measuring the observed deviation of the *target* from the *splash*. This is continued until we get an approximate track of the ballistic range of the target. By inspection we should be able to draw a curve through these observations such that the residual errors will be a minimum. This curve will represent the most probable track of the true ballistic range of the target, and as in our present method of tracking a moving target we should predict thereon for the correct data to be set on the gun for subsequent shots. (See Figure I.)

The idea that we should not be continually adjusting is a false idea which we have inherited from the "stationary target" problem. We must keep in mind that our purpose is not so much to *obtain* adjustment as it is to *maintain* adjustment. *The deviation of every shot has a corrective value proportional to the square of its deviation.* (Not mathematically accurate, but a close approximation for deviations not exceeding four probable errors.) These corrective values must be applied continually in order to secure the maximum benefit from the Law of Probabilities.

It is believed that the above discussion may be better understood if we consider the adjustment of fire as a method of position finding. For the purpose of illustration let us assume that the only method of position finding available were an airplane observer. This observer sends us the approximate range and azimuth of the target, also its approximate direction and speed of travel. Using a time-range board and a time azimuth board at the gun the approximate curves for the ballistic ranges and azimuths, respectively, are drawn. The gun is fired on this approximate data. The shot falling somewhere in the vicinity of the target the observer now will be able to give fairly accurate information as to the ballistic position of the target, by estimating the distance of the target from the splash, whose ballistic position is known. These values for the range and azimuth of the target are plotted on the time data boards, and constitute the first observation of the position of the target. Now if a number of shots were fired at 30 second intervals and this process repeated, within a very short period of time, the time data curves could be established so that predictions could be made thereon for effective fire, regardless of any conditions of wind, atmosphere, muzzle velocity, range table errors, orientation, or anything that might cause a variable error. The curve thus established is the resultant of all of these effects as well as the effect of travel. This curve establishes the bal-

listic travel of the target. This is a direct method of fire control and should prove very effective in maintaining adjustment as long as observation is possible. It should be noted that in this case adjustment corrections are not applied, but are absorbed in all data set on the gun. The only personnel required in this system of fire control are two time-data board operators, and an observer. The more rapid the fire delivered at the target the more effective this method becomes.

We should now consider position finding, as the term is ordinarily used, as being a means for adjusting, rather than adjusting as a means of position finding. We are not primarily concerned with the actual position of the target. Its ballistic position is what is sought. Since the actual travel of the target usually constitutes the major portion of the ballistic travel, it is very important to accurately determine the actual travel whenever possible, so that the ballistic travel may be corrected, therefore materially facilitating the problem of adjustment.

DETERMINATION OF ARMAMENT ERROR

In every series of shots fired at a target there is an occurrence of a combination of all three of the classes of errors as named above. It is impossible to ascertain these errors, but we can ascertain the resultant residuals. We know that accidental errors follow a definite law, and if the residuals obtained do not follow this law we have proof of some other class of error existing. To treat these resulting residuals as accidental errors is fundamentally wrong. For the purpose of analysis there is a very simple method whereby the constant and variable errors may be practically eliminated and a fairly accurate value for the accidental error may be obtained. This can be done by taking the differences between the corrected fall of successive shots, and using these differences, instead of the deviations of the individual shots from the center of impact, as the basis for computing the probable error. The law of probability provides that these differences between successive shots will be equal to the square root of 2, or 1.4, times the deviations of single shots from the center of impact. By obtaining the mean of these differences and dividing this by 1.4 and multiplying it by .845 we obtain a fairly accurate value for the probable accidental error developed. Where there is a large variable error introduced, and the series extends over any considerable length of time, the difference between the first and the last shot of the series should be distributed, in proportion to the time difference, between all the shots in the series.

The following is an example of this method:

EXAMPLE OF DETERMINING PROBABLE ARMAMENT ERROR

(Data used taken from actual firing. See Fig. 1)

Shot No.	1	2	3	4	5	6	7	8	9	10	Remarks
Gun No.	1	2	1	2	1	2	1	2	1	2	
Range to set-forward point.	1501.5	15000	14930	14910	14825	14805	14670	14660	14430	14450	(a)
Corrections applied.	+250	+250	+330	+330	+285	+285	+230	+210	+20	+20	
Ballistic range to splash.	15265	15250	15260	15240	15110	15090	14900	14870	14450	14430	(b)
Deviation of target from splash.	+100	+60	-120	-170	-160	-230	-210	-180	-120	-120	
Ballistic range of target.	15365	15310	15140	15070	14950	14860	14670	14660	14270	14310	(c)
Time of splash.	1	2	7	8	13	14	20	21	28	29	(d)
Correction for variable error.	0 × 38	1 × 38	6 × 38	7 × 38	12 × 38	13 × 38	19 × 38	20 × 38	27 × 38	28 × 38	(e)
Correction for calibration.	0	0	+40	+230	+270	+460	+490	+720	+760	+1030	+1060
Corrected ballistic range of target.	15365	15350	15370	15340	15410	15350	15390	15420	15300	15370	(f)
Range difference between successive observations	—	15	20	30	70	60	40	30	120	70	(g)

Remarks: (a) Method of adjustment used: Successive approximations.

(b) Efficiency of adjustment = 22%.

(c) $d_1 - d_{10} = 1055$ yards.(d) $t_1 - t_{10} = 28$.(e) Variable Error = $\frac{1055}{28} = 38$.

(f) Note:—37 yards difference in average ballistic range of No. 1 and No. 2 guns due to variable error.

(g) Mean = 50 yards.

$$\frac{0.845}{\sqrt{2}} = 0.6$$

Probable Armament Error = $0.6 \times 50 = 30$ yards.

Probable Armament Error as shown by Battery Commander's Report = 132 yards.

It should be noted that the above method does not make use of the Center of Impact. The true center of impact has no constant value.

In re-computing the probable error of a great number of practices held in the past by the method outlined above it has been discovered that almost invariably the probable armament errors as shown in the original analysis have been too large. In most cases the constant or variable errors entering therein become plainly evident. Especially in mortar practices were variable errors encountered, in some cases reaching in magnitude to 50 yards per minute. Calibration errors were also frequent, and easily detected as constant errors.

As a result of experiments along this line the conclusion is reached that in all of our armament we have been assigning too large a value for the probable error.

It is believed that the probable range error for mortars at mid-ranges is about 30 yards, and for major caliber guns at 15,000 to 18,000 yards, it is about 50 to 75 yards.

THE FOUR STANDARD METHODS OF ADJUSTMENT

Much has already been said in criticism of the four standard methods of adjustment as used in our target practices. It is now generally conceded that they are inadequate in their application to adjustment on moving targets. However, these represent the best which we have developed thus far, and we should make use of the experience gained in their use for developing something better. With this consideration in view it is deemed pertinent to discuss a few fundamental errors which we have been permitting. For instance, the method of Successive Approximations, as modified for use with moving targets, provides that "After one shot (or salvo center of impact) has fallen in the 50 per cent zone, require two successive deviations of the same sense and both greater than one probable error before making a further correction." The key to the application of this rule is the *probable error*, yet the fact that the probable error of a "salvo center of impact" differs from the probable error of a single shot is ignored. The probable error which should be used in applying this rule to the use of a salvo of four shots should be exactly one half the probable error used with the same armament when the adjustment is by single shots, in order to secure the same results. This is a mistake that even the author of this rule makes in one of his examples of its application. In many cases this has been directly responsible for poor adjustment, but this is not so criminal as is the fact that a fundamental law has been violated.

The method of Successive Approximations as prescribed in Coast Artillery Memorandum No. 4, provides that "If after six shots adjustment has not been secured a new series of numbers

should be begun, applying the rule as before." Here, too, it appears that an error has been made. Adjustment is solely dependent upon the observations of past shots; then why should we throw away this valuable and costly experience for which we have paid the price of six shots? That these shots did not hit near the target is no reason for discarding them. As long as we know where they hit they serve their purpose. Under the circumstances they should be of even more than the ordinary value to us in the determination of the cause of such a condition.

The Trial Shot Method no doubt will always be of valuable use in the adjustment of artillery fire. However, it should be classified as a method of preparation of fire rather than as a method of adjustment.

The salvo center of impact method is always dependable for a certain degree of accuracy in any case where the ballistic travel of the target is not so great as to require a predicted correction. However, it makes full correction for accidental errors, which is wrong in principle, and its inherent error is equivalent to the dispersion of the centers of impact of the salvos used.

The Bracketing Method is a field artillery method and has no practical application to moving targets.

None of the above methods make use of the time element, a fundamental consideration.

In this connection it may be stated that the general use of the Field Probable Error as being one and one-half times the range table probable error is exceedingly arbitrary and wholly unjustified. In doing this we are admitting an error due to field conditions even larger than the armament error. If our range table probable error were 50 yards, and we combined therewith other effects which caused a probable error of 50 yards, the resultant, or field probable error would be only 70 yards. This seems to be entirely excessive.

SUGGESTIONS FOR METHOD OF ADJUSTMENT

The best that may be expected from any method of adjustment is that it will interpret the law of probability to a mathematical exactness. This we should strive for. While the values we will thus determine to be the most probable values may be far from the absolutely correct values, yet we must realize that it is impossible to know these correct values, and should we use the most probable values, in the long run, our results would reach the maximum efficiency possible.

In order to interpret this law of probabilities, as applied to changing values it is essential that the time element be considered.

It is suggested that what we should attempt is a solution of this problem rather than a method of adjustment. If this problem can be solved, then every artilleryman should be required to follow this law, and the means by which this is accomplished will be of no particular importance.

It is with this hope of an ultimate solution that the following suggestions are offered.

The corrective value of any deviation is in proportion to its improbability of being an accidental error. Accidental errors as such have no corrective value. The improbability of a deviation being due to an accidental error is proportional to the square of the deviation, therefore, the comparative corrective values of a number of deviations of different magnitude are proportional to the squares of the respective deviations. This means that if a unit correction value were assigned to a deviation of one probable error, a deviation of two probable errors would have a corrective value of four, a deviation of three probable errors a corrective value of nine, of four probable errors, a corrective value of sixteen, etc.

This law of corrective values should be a fundamental principal of any method of adjustment. Every deviation, no matter how small, affects the result of the final determination of the most probable value. There is no dividing line between small deviations and large deviations, whereby they may receive different treatment. As a matter of fact in some of the present methods of adjustment we make an arbitrary division of these deviations into two classes, namely, those indicating a correction due, and those indicating proper adjustment. Treatment such as this is purely arbitrary and is no doubt responsible for the general use of the term "arbitrary correction" as applied to adjustment correction in artillery fire.

Knowing this law of corrective values, how may we apply it? A number of difficult methods may be employed varying in degree of accuracy and practicability. A logarithmic slide rule may be used, whereby the deviations may be promptly converted into corrective values. This slide rule may also be provided with means of adding these corrective values algebraically, thereby keeping a record of all cumulative corrective values which have not previously been applied.

A simpler method would be to give each deviation a corrective value equal to the amount of its deviation in excess of one probable error. This method very closely approximates the correct law, and is very easy of application. (See Figure 2.)

In order to correct for variable errors there must be an adjustment of values against time. The adjustment correction for each shot must be predicted. This problem is identical to our prob-

CURVES SHOWING RELATION BETWEEN
DEVIATIONS AND CORRECTIVE VALUES

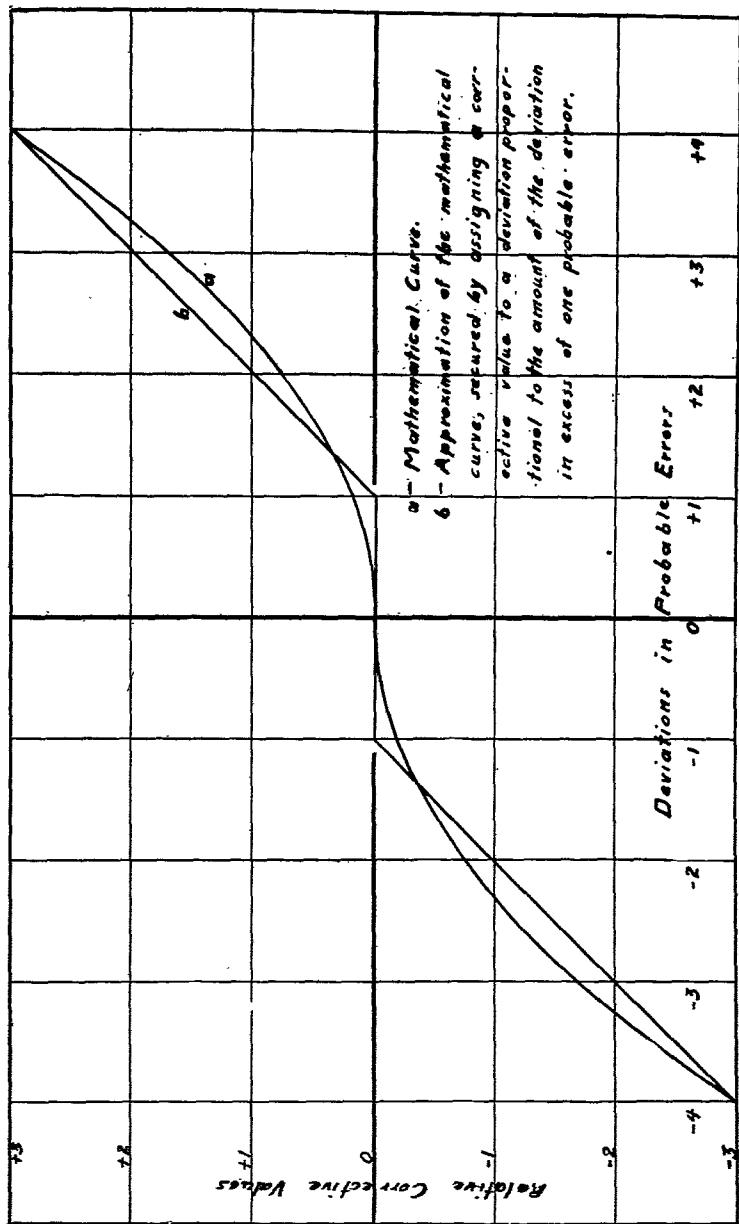


FIG. 2

lem of obtaining the set forward point, and our method which we use for this is a satisfactory interpretation of the law of probability.

The following is suggested as a basis of experimentation for the possible development of a practical solution of this problem:

1. Two classes of corrections must be applied after each shot:
 - (a) Flat corrections (for constant error.)
 - (b) Travel corrections (for variable errors.)
2. Flat corrections must be in proportion to the square of the deviations.
3. Travel corrections must be in proportion to the algebraic sum of all previous flat corrections and should be applied on uniform time intervals, whether or not a shot be fired.
4. The constant factors which reduce these proportional values as stated above to absolute values may be an empirical fraction which may be experimentally deduced.
5. When only sensings are determined assign values for deviations as follows:

For a sensing which contradicts the next preceding sensing assign a value of one probable error, for two successive deviations of the same sensing assign a value of two probable errors to the second, for three successive deviations of the same sensing assign a value of three probable errors to the third, for four successive deviations of the same sensing assign a value of four probable errors to the fourth, etc. (See Figure 3.)

From an inspection of Figure 1, the question naturally arises as to the necessity of any method of adjustment, other than a plot of the ballistic range of the target. This method is recommended for its simplicity and practicability.

With such a picture as is presented in this illustration before him no battery commander would ever permit such poor adjustment as was maintained in this problem (Fig. 1). Had the battery fired on every bell the track of the ballistic range of the target would have been still more obvious.

It is believed that if no method of adjustment were prescribed for the battery commander, and the efficiency rating of his practice were determined mainly on a percentage basis, using the relation of the mean armament error to the mean deviation actually obtained, that within a short time an efficient method of adjustment would evolve.

OBSERVATION AND SPOTTING

Adjustment of fire is based solely on observation of fire. No matter what method of adjustment is used, its accuracy is dependent on the accuracy of observation.

EXAMPLE OF METHOD OF ADJUSTMENT

Rule:-

1. After preparation of fire, continue at maximum rate.
2. Make flat correction on each reported deviation equal to $\frac{1}{2}$ the amount of the deviation in excess of one probable error.
3. Make an additional Ballistic Travel correction on each shot fired equal to $\frac{1}{2}$ the algebraic sum of all previous flat corrections.
4. Apply corrections thus determined on the next shot fired.

Time of Firing	Hit Bng Dist	PE + 40 yds	Range Table Error	One Deviation from Cor. then made	Total Correction used	Actual Deviation	Flat cor. to be in excess of one P.E.	Travel cor. + $\frac{1}{2}$ algebraic sum of previous flat cor.	Total new Correction	Splash No.
1	+ 60	+ 100	+ 160	- 100	+ 60		In the air			
2	+ 20	+ 120	+ 190	- 100	+ 90		In the air			
3	+ 50	+ 140	+ 200	- 115	+ 85		- 10	- 5	- 15	1
4	- 30	+ 160	+ 130	- 120	+ 10		0	- 5	- 5	2
5	0	+ 180	+ 180	- 155	+ 25		- 20	- 15	- 35	3
6	- 120	+ 200	+ 80	- 170	- 90		0	- 15	- 15	4
7	- 20	+ 220	+ 200	- 185	+ 15		0	- 15	- 15	5
8	+ 30	+ 240	+ 270	- 165	+ 105		+ 25	- 5	+ 20	6
9	- 20	+ 260	+ 290	- 170	+ 70		0	- 5	- 5	7
10	+ 40	+ 280	+ 320	- 220	+ 100		- 30	- 20	- 50	8
11	- 60	+ 300	+ 290	- 260	- 20		- 15	- 25	- 40	9
12	+ 80	+ 320	+ 900	- 330	+ 70		- 30	- 40	- 70	10
13							0	- 40	- 40	11
14	mean			mean			- 15	- 75	- 60	12
15	45 yds	Efficiency = 80%	80%	57 yds						

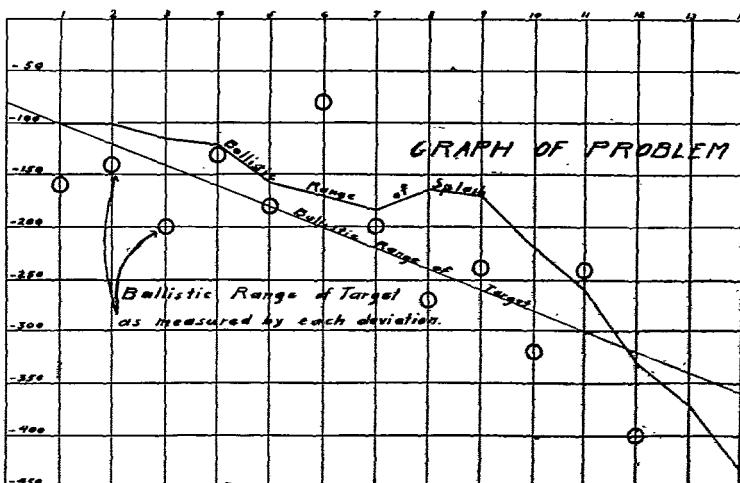


FIG. 3.

Whenever observation is impossible we have to rely solely upon computed ballistic data in fire for effect. Our gunnery instructors use this possible condition in order to emphasize the importance of extreme accuracy in the computation of firing data. Let us consider the possibility of this condition in the case of naval targets. If observation on a moving target is impossible how are we to determine its position? Will we be able to compute any ballistic data when we are unable to determine its map data? In the case of land firings this consideration is important, for we can compute our data from the map position of the target, and we will be able to fire, with a fair probability of obtaining hits, without observation. There is only a bare possibility that we may be able to track a target and not be able to observe the splashes, while a great many situations may occur especially in combat, where we will be able to observe splashes, but will be unable to track the target.

Under the most favorable conditions of combat the horizontal base system of position finding is unwieldy and of doubtful value. When a fleet of any size is maneuvering, as it would do in combat, changing formations and relative positions, it is practically impossible to get two observers, who are widely separated, on the same target. Under the most probable conditions of combat it is believed that this system of position finding will prove a failure. Smoke screens may and very probably will preclude the use of any terrestrial observation, except from some possible vantage point on the flank. Under such conditions our present system of accurately calculating ballistic data will be of little use to us. Our fire control will depend upon observations by airplane, balloon, sound-ranging, or terrestrial observation from such positions as the conditions permit. Accurate measurements of the position of the target will be impossible, but its ballistic position may be determined with a fair degree of accuracy by an estimate of the deviation of the splash. The facilities for spotting are much greater than the facilities for map ranging. At present the relative importance of the three phases of fire control, as reflected in the training of the personnel are: 1st, position finding; 2nd, adjustment; and 3rd, spotting. It is suggested that this may well be reversed. Adjustment is the end sought, and spotting is a prerequisite, while position finding only facilitates adjustment.

It is believed that spotting may be greatly facilitated by having the splashes occur at uniform time intervals. For example, let us suppose a case where six major caliber guns are firing at one or more naval targets, each firing at intervals of one minute. If the splashes of these guns, numbering from 1 to 6, should occur ten seconds apart, at time 10", 20", 30", 40", 50", and 60" respective-

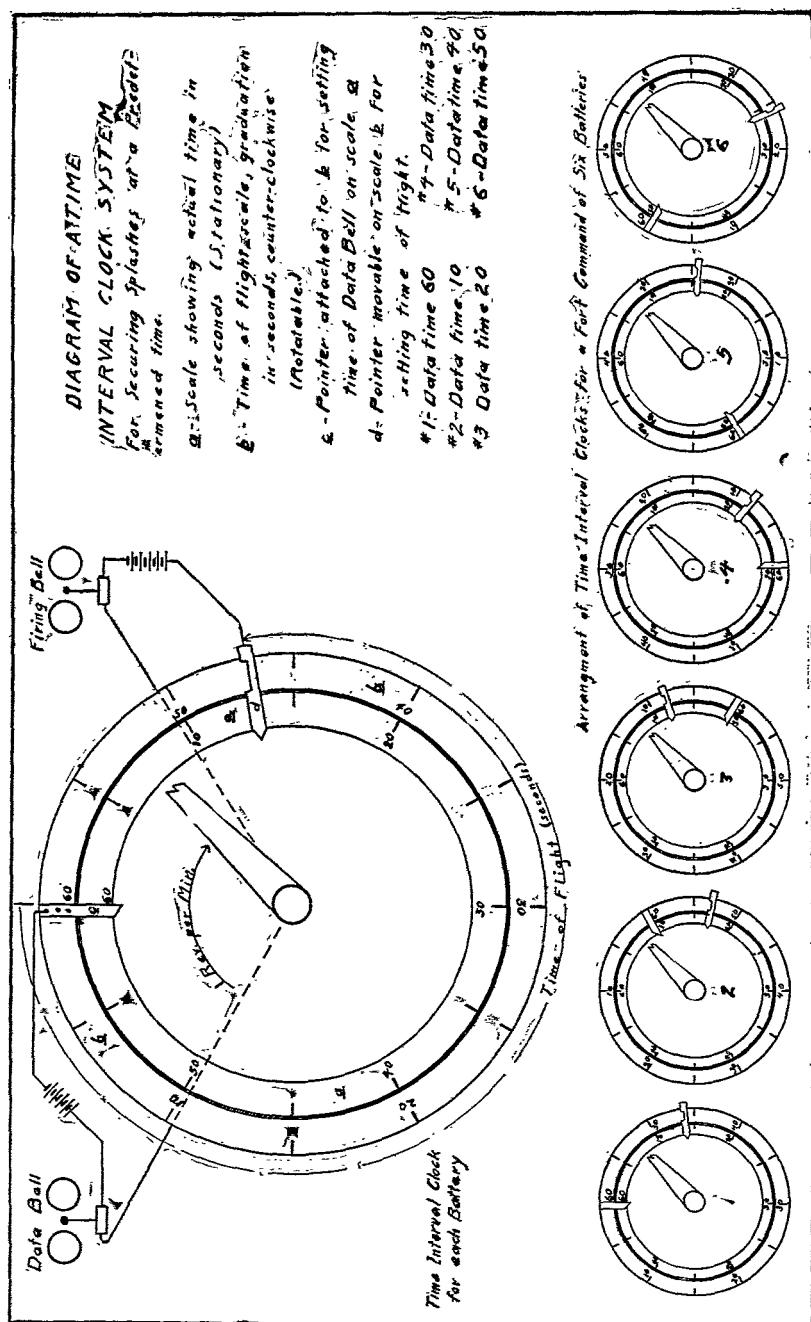


FIG. 4

ly, then one observer would be able to spot for the entire six guns. This may be six batteries firing in salvos, either simultaneously or a few seconds apart. This can be done in a very simple manner. All that is necessary to adopt a setforward point of uniform travel time, and fire the gun at the time indicated by a time of flight table. This system is believed to be both simple and more accurate than the present system of using the travel during time of flight in the determination of the set forward point. This feature of firing the gun, so as to secure a splash at a predetermined time, may be easily taken care of mechanically by having a firing bell at the gun connected electrically to a clock in the plotting room on which the time of flight may be continually set. The gun may be fired on the bell. (See Figure 4.)

It would be a comparatively simple matter to have the time interval apparatus for a fort or coast defense so arranged that each battery or fire command would have a separate data bell, which would be a permanent characteristic of that particular battery or fire command. Six firing units could be taken care of in this manner, with a difference in splash of 10 seconds each, or four units with a splash difference of 15 seconds, this being based on the rate of fire of one shot per gun per minute.

Unless use is made of some such system as suggested above, spotting in combat will be a difficult procedure, and adjustment, as a consequence, ineffective.

A favorable physical impression made upon associates and those with whom one has business dealings increases their confidence and their possessor's earnings. An erect carriage, courteous manner, poise, neatness of dress, and a generally excellent appearance have money values of their own in their effect upon others, but even more important psychological results in the individual himself. They give him self-respect and self-confidence. He approaches his problems with more assurance and fewer doubts in his own ability.
—John W. Weeks.

The Decision to Defend Kut-el-Amarah

By MAJOR E. W. C. SANDES, *D. S. O., M. C., R. E.*

[REPRINTED BY PERMISSION OF *Royal Engineers Journal*]

A SMALL boat, with a picked crew and an expert steersman, once put to sea in fine but threatening weather. She was safely launched, and rode undamaged through several lines of breakers, being handled with daring and skill, so that at last only one line foamed and spouted ahead of her. But the tide was already on the turn, and a storm was brewing, so the steersman hesitated to make the attempt which would bring him to the open sea. In the end he made a dash for the last line of breakers, hoping to get through at the first attempt and relying on the proved courage and grit of his men, but the waves checked the boat, and the incoming tide gradually brought her to a standstill. The exhausted crew battled furiously to make headway. Two men were swept overboard, and the boat was almost swamped and began to leak, so the steersman decided to make for harbor. He managed to turn between two waves and ran for home. The storm roared behind him and his boat was sinking, but he saw a sandbank and grounded her under its lee, intending to rest his crew and repair the boat while the storm lasted, and then to try again. He forgot the tide. It rose slowly, and finally engulfed him and his men within sight of their friends on shore, many of whom perished in attempts to reach the castaways.

This allegory represents, in some ways, the case of the late General Sir Charles Townshend and his force in the attempt to capture Baghdad in 1916, and his retreat to, and surrender at, Kut-el-Amarah. The 6th Indian Division was a highly trained force, and its commander a skilful strategist and tactician who had the complete confidence of his men. The boat was launched at Basra, she forced a passage through the breakers at Kurna and again at Kut, and her commander hesitated before the waves below Baghdad but decided to make the attempt. The tide of Turkish reinforcements from the north checked his small craft, and, with a reduced and exhausted crew, he managed to turn his leaking boat and reach the island of Kut. There the tide of the enemy gradually overwhelmed him within a few miles of the relief force which battled so desperately to reach him through the stormy seas which separated

them. The allegory fails in one respect, in that General Townshend's idea in remaining in Kut was not only to rest and save his men, but to check the advancing foe; but, just as King Canute found that a tide cannot be checked, so Townshend found that the enemy encircled him and soon passed far beyond the limits which he had anticipated when he halted.

* * * * *

It was in November, 1915, that the 6th Indian Division, with the 30th Brigade and a few other attached troops, gained a partial success over the Turks at Ctesiphon. The Turks, however, were strongly reinforced during and after the fight, and the British force, under Townshend, suffered such casualties that it was compelled to retire a distance of 100 miles to Kut-el-Amarah, pursued by large bodies of the enemy which had arrived from Erzerum and elsewhere. General Townshend's force of about 10,000 men, including roughly 6000 infantry, was harassed in the retreat by the advanced guard of the Turkish army under Nur-ed-din Pasha, and that advanced guard was superior to it in numbers, and even in armament. The Turkish force was composed of the best Anatolian troops, elated by the retreat of the hitherto victorious British, and guided by the advice and experience of a large staff of German officers. The British, nevertheless, defeated the Turkish advance guard at Ummal Tabul during the retreat, and thus enabled most of their shipping to reach Kut. This action checked the enemy sufficiently to give Townshend a few days at Kut, prior to the arrival of the enemy, in which to begin to entrench.

The troops, however, were terribly exhausted—so exhausted that, on reaching Kut on the 3rd of December, 1915, they were quite incapable of constructing in a few days a complete system of trenches and redoubts for defense against the advancing hordes of the Turks. Rest was imperative, and the question was whether rest could be obtained. It was partly the necessity for rest and reorganization for his retreating force which caused General Townshend to halt at Kut on the 3rd of December, 1915. He had not decided till that date, whether he would remain in Kut or not. To quote his own words: "It was practically impossible for me to retire from Kut. So exhausted were my troops that they lay down and could do nothing but eat and sleep for two days." The human factor, then, became an important one in the situation, as it does so often in actual warfare, and the halt of the British force enabled the Turks to regain touch with it after it had outdistanced their pursuing troops in a series of forced marches.

I have given a brief *résumé* of the operations leading up to General Townshend's arrival in Kut from Ctesiphon as it is neces-

sary to visualize clearly the circumstances under which he was forced to decide whether he would halt at Kut and subsequently continue his retreat, or whether he would remain in Kut and defend it against the advancing enemy. I think that any officer who took part in the retreat will agree that, whether Kut was held or not, a *halt* at Kut was imperative. The marvel is that the British force ever reached Kut. I do not think that it would have done so if the pursuit had been pushed with vigor and in a scientific and efficient manner. Fortunately, the Turks still had a wholesome respect for our offensive powers, and the Turkish leaders made several gross tactical blunders which prevented our retreat from being cut off.

Field Service Regulations, Volume II, Chapter XI, which deals with the subject of "Defense," gives the following axiom: "When a commander decides to adopt a defensive rôle, the manner in which he will be able to carry out his plan will depend largely upon the time available for preparing his defensive organization, and upon the general situation in the theatre of war. Thus circumstances may only allow of a hastily organized defense, or they may permit of the deliberate occupation of a well-organized defensive position *commanding a line of advance which is essential to the enemy.*" The line of the River Tigris was essential to the advance of the Turks, though the Kut peninsula was not a well-organized defensive position. The fact that the line of the Tigris was essential to the enemy, if he desired to advance any considerable distance into Lower Mesopotamia, was the main point which decided General Townshend to establish himself at Kut. By remaining there until relieved he also denied to the Turks the use of the Shatt-al-Hai Channel leading to Nasariyeh, which might have enabled them to advance on Basra or Amarah, by a flank attack from the west, when that channel filled with water early in January.

On the 3rd of December, 1915, General Townshend decided not only to halt at Kut but also to *remain* in Kut, and he informed the Army Commander, General Sir John Nixon, to that effect. So momentous a decision, in a minor theatre of war, has rarely been taken by a subordinate officer. The responsibility of making that decision was left to General Townshend by the Army Commander, who, however, on the 4th of December, gave him seven arguments in favor of defending Kut and notified his approval of the decision. In his own opinion General Townshend was forced, in the first instance, to decide between the possible loss of his Division and the probable loss of Mesopotamia. Can one wonder that, maintaining the tradition of offensive action so dear to the British Army, he decided to fight and to risk the loss of his force rather than to retire and perhaps lose the country which he had conquered? That he did

actually lose his force, and that more than 20,000 men were sacrificed in vain endeavors to save that force, was decreed by fate; yet, if it was a mistake to defend Kut, his action should not be judged without a full consideration of the circumstances which induced him to make his decision. Let us consider those circumstances.

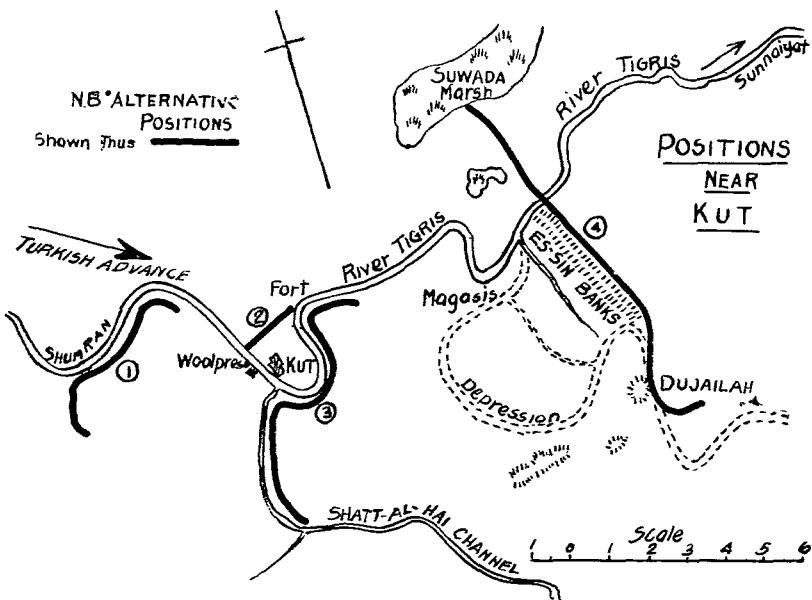
Firstly, the British force was exhausted on reaching Kut. It could retreat no further, though in a few days it might be able to do so. It was accordingly tied to Kut for, say, three or four days.

Secondly, if it remained in Kut and fortified that locality, it blocked not only the River Tigris to the enemy's shipping, but would also deny the Shatt-al-Hai channel to that shipping when the channel became flooded. The Turks had only five ships upstream of Kut, and they depended on those ships for their ammunition and equipment, and to some extent for their reinforcements and food, though they could live on the land as no British force could. They could not carry the war far into Lower Mesopotamia if Kut was held. They had not sufficient land transport to maintain a large army advancing further and further into a pestilential region, even though the Arabs of that region might be friendly while success attended the Turkish advance. While Kut was held, the Turks were tied to it by a string of a certain length—not by a piece of elastic. If too much strain came on the string it would break; it would not stretch.

Again, General Townshend was fully aware that reinforcements were only dribbling into Mesopotamia and were a long way off. He was informed on the 5th of December, two days after his arrival, that he might count on being relieved in two months, and that a force was being concentrated as soon as possible at Amarah, more than 100 miles away to the southeast, with a covering force of only one brigade at Ali-al-Gharbi, 30 miles to the east. Note the words "as soon as possible." Townshend could not hope to be *adequately* reinforced at Ali-al-Gharbi if he retreated from Kut. He might meet reinforcements before he reached Amarah. But could he reach Amarah, harassed by thousands of Arabs, and possibly pursued in time by large bodies of the best Turkish troops? It seemed problematical at the time. Those who had seen the force enter Kut on the 3rd of December might not even have conceded that it was problematical. General Townshend decided that his reinforcements were not sufficiently near him to warrant a further long retreat in an endeavor to meet them. He decided to wait for their close approach and then to cooperate with them. He was exhausted. They would be comparatively fresh.

The British force was small—about 7000 infantry. Supposing that a prolonged retreat was impossible, the question arose as to

whether this small force could take up a position where it could reasonably expect to withstand the Turkish onslaught for a time, preparatory to further retirement towards its reinforcements. It had very few machine guns, and little modern artillery except for three batteries of 18-pounders; therefore it could not occupy an extended line. It had not much barbed wire, and no bombs. For defense it had chiefly to rely on rifle fire. Was there a position of, say, not more than two miles in length where its flanks would be secure? Yes. A position across the neck of land forming the loop of the river Tigris containing Kut would fulfill those conditions. It has been said that General Townshend should have retired to the



Es-Sin position, a line of embankment some seven miles below Kut town, where trenches existed. That position was six miles long on the right bank of the Tigris and three miles long on the left bank. The trenches also faced the wrong way. Possibly an Army Corps with plentiful machine guns might have been able to hold Es-Sin and to protect its flanks from envelopment, but certainly not a force of four weak brigades. Supposing that General Townshend had retired to the Es-Sin position, how long could he have maintained his force there? There were no supplies in the position. There was no transport to bring sufficient quantities of provisions and ammunition from Kut to the position if it was to be held for a week or more. There was no water at Es-Sin except near the river. Amarah was the nearest point from which supplies could be obtained from

downstream. General Townshend subsequently wrote as follows: "Had I taken up my position at Es-Sin, I should have been enveloped and overwhelmed in a decisive battle in three or four days' time." Was there, then, any other position which the British force might have occupied for a time preparatory to retirement? If it could have crossed to the right bank of the Tigris it might have taken up a position on that bank near Shumran, four miles above Kut, placing the Tigris between it and the enemy owing to a bend in the river, and with its left flank only exposed to envelopment if the Turks crossed to the right bank. This they could not do at once as they had no bridge. On the other hand, we had a Bridging Train and I think that I could have constructed a bridge for the crossing of our force, though not at Kut itself. This Shumran position was recommended by the Brigadier-General, R. E., and a further retirement could have been executed from it to the Shatt-al-Hai channel which could have been held temporarily as a rear position; but the occupation of the Shumran position would have meant the abandonment of the left bank of the Tigris and of Kut town with all its supplies, and a subsequent retreat under fire from Kut on the flank. Also, we could not have taken sufficient supplies to the position for more than a few days.

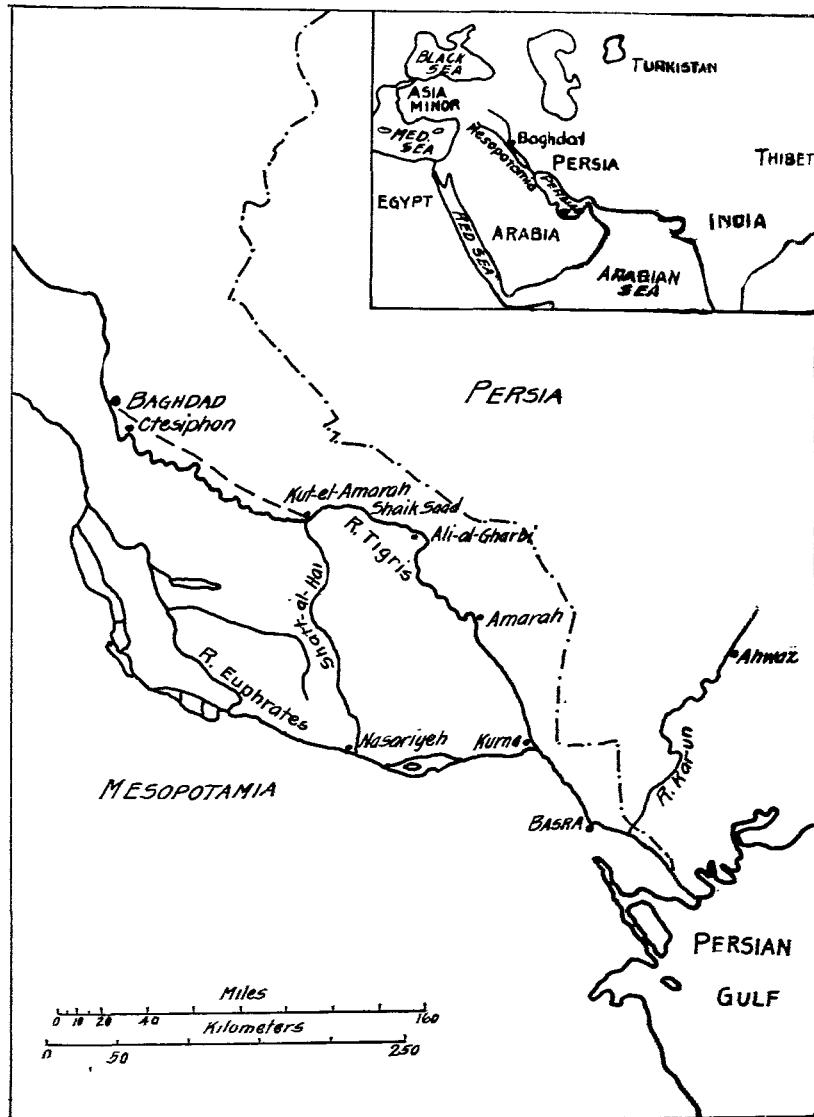
General Townshend decided that the only locality in which he could put up a defense, and also maintain his force for a reasonable time, was in the loop of Kut. Here he was secure. His flanks were safe, his rear was safe, he could hold his front line against determined attacks, and, as *Field Service Regulations* put it, "He commanded a line of advance essential to the enemy." He has been criticized for adopting an attitude of passive defense. That was not his intention. To quote his own words once more: "I intended to use my entrenched camp as a pivot of maneuver, when, by improvising a bridge and a fortified bridgehead, I should be able to throw the principal mass of my force on to either bank of the Tigris in an offensive against an isolated fraction of the enemy. Had my troops been able to work and get the bridge across the Tigris opposite the town of Kut, I should have been able to make an *active* defense." General Townshend was well aware of the usual fate of a force which shuts itself into an entrenched camp for a passive defense. The outstanding example of Marshal Bazaine at Metz in the Franco-Prussian war was ever in his mind. But his plans for an active defense were stultified by a lack of engineering information, and in this respect I should like to indicate how important is the question of the *liaison* of the General Staff with the engineers. A bridge across the Tigris opposite Kut was impossible. I commanded the Bridging Train and had lost most of my boats and all my pontoons

during the retreat from Ctesiphon when we were chased by cavalry and had no escort. The river was 600 yards wide opposite Kut town, and I could have told the G. O. C. at once that the maximum length of bridge which I could construct, given several days to do so, was, roughly, 300 yards. If General Townshend had been aware that his system of active defense was thus rendered impossible, he might have altered his decision to remain in the loop of Kut. But he apparently assumed also that he could prevent the Turks from bombarding any bridge with artillery. A large bridge cannot be maintained for more than a few days under hostile artillery fire without great reserves of material and boats, and we had no such reserves of a suitable nature. If a bridge had been constructed it would infallibly have been destroyed by the Turkish artillery or mines, or captured by a determined assault, and the defense of Kut would then have become passive, at least, as regards the right bank of the Tigris. On the Kut side, *i.e.*, the left bank, the Turks quickly surrounded our entrenched system with three lines of trenches, well wired, strengthened by redoubts, and supported by artillery. Sorties in force on this bank soon became difficult, and later impossible, owing to the flooded ground. Again, it would seem certain that the intended active defense was doomed to develop into a passive one. However, the Kut loop was considered to be the only possible defensive locality, and it was occupied and strengthened as far as our men were able. The land front to be defended was one and one-fourth miles long and the river protected the flanks and rear. The Turks were in front and the river behind; in fact, we were between the devil and the deep sea.

Another point influencing the decision to defend Kut was that it was our advanced base for supplies, stores and ammunition. These had been accumulated for weeks. The shipping downstream was fully employed in bringing up reinforcements and could bring no more stores. The enemy was naturally short of supplies and would benefit greatly by the recapture of Kut. It was therefore of great importance to preserve our supplies and also our store of ammunition. There was not sufficient transport to remove the bulk of the supplies and stores if we evacuated Kut. On the other hand, the supplies would enable us to withstand a siege of some duration—at any rate, as long a siege as then seemed likely.

However undesirable they may be, political considerations are apt to influence military operations. Kut was no exception. The Political Department was emphatic regarding the bad political effect which would be produced throughout Mesopotamia by a further retirement downstream. The Political Officer pointed out that in such an event our half-hearted Arab allies would go over to the

Turks, the country would rise against us, and our prestige would be gone. Also, the failure of the Gallipoli campaign, and the situation in Persia and Afghanistan, made it advisable to avoid the bad



effect of a lengthy retirement towards Amara. Again, when General Townshend had decided to remain in Kut and wished to evacuate all the 6000 Arabs in the town, he was advised politically that the death of the Arab women and children in the desert, which would

probably result from this evacuation, would be a cause of renewed hatred against us, and so most of the Arabs were allowed to remain in Kut where they did little work and ate a vast amount of food. The necessity of maintaining British prestige in Mesopotamia thus influenced General Townshend in reaching his decision to retire no further than Kut, and certainly shortened the period of resistance of which the garrison was capable when surrounded by the Turks.

The Russians under General Baratoff were demonstrating towards Baghdad from Persia, and it was advisable to cooperate with them. By holding a large Turkish force at Kut the British assisted their allies from Russia. The Russian force, however, had little driving power. It consisted mainly of irregular cavalry with only a few guns. When the Kut position was occupied the limitations of the Russian offensive were scarcely understood.

A last consideration, which doubtless influenced General Townshend in his decision to hold Kut, was the necessity of allowing the increasing force downstream as much freedom of action as possible, *i.e.*, space in which to maneuver in country suitable for maneuver and well above the swamps at Amarah. The force downstream could then concentrate unhindered and maneuver freely for offensive action. It would have the initiative.

I have tried to show what were the considerations which induced General Townshend to hold Kut, but there are two sides to every question and many people have disagreed with his decision. He had eluded the Turks by a skilful rear guard action and a rapid retreat, and, though he had not been reinforced to any extent, he then allowed himself to be overtaken and surrounded by greatly superior forces. Again, on his own admission, he underestimated the capability of the garrison to hold out. This was caused partly by incomplete reports of the amount of supplies available in the town (a very difficult matter to estimate), and partly, perhaps, by too modest an opinion of the ability of regular troops to exist on reduced rations. But it was due, also, to his estimate of the condition of his troops. He considered that they were too exhausted to withstand the physical and mental strain of a heavy assault or a long siege. The Indian regiments had lost most of their British officers, and the casualties early in the siege were heavy. Most of the General Officers in Kut considered that a really determined assault by the Turks within the first six weeks would have succeeded if pressed home regardless of losses. The Turks actually assaulted on the 10th and 12th of December, 1915, and, on Christmas Eve, they almost captured Kut, but by that time we had some trenches, and the assault was not made in sufficient strength. Anyhow, the underestimation of the garrison's ability to resist the Turks was unfor-

tunate for the relief force, which attempted attacks without adequate preparation in order to save Kut. The repeated failures of the small relief force gave time for the Tigris to rise to flood level and thus to render the relief practically an impossibility. General Townshend, when he decided to remain in Kut, never contemplated a siege of such length as to last till the flood season in March, and he was supported in this estimate of the probable duration of the siege by the receipt of a telegram from the Army Commander in which the latter stated that two months might be considered the outside limit before a general move forward would be made by the relief force. General Townshend stated in his book, written after the war, that he did not realize at first that the Turks were being directed by a German staff, and he was consequently surprised at their initiative. The unbroken series of successes of the 6th Indian Division had greatly impressed the population of Iraq and also the Turks themselves, and Townshend considered that the Arabs would exaggerate, in their reports to the Turks, the numbers of reinforcements for the relief force and that the Turks would, in consequence, hesitate to advance much beyond Kut. Events proved that he was mistaken. The Germans clearly realized the situation and sent the Turks to occupy positions as far downstream below Kut as their overland transport would admit. The Turks were soon organized in depth below Kut, and that fact, aided by the floods, gradually brought the relief force to a standstill and finally led to the surrender of the Kut garrison from starvation.

General Sir Charles Townshend was a most capable commander in the field; he had the complete confidence of all ranks during the campaign preceding the siege; he was a keen student of military history and a man of remarkable character; but he was broken by the failure of the attempt to capture Baghdad—one of the most desperate ventures in military history—he was crushed by the change in his luck, by illness, and by the collapse of his hopes. A commander's reputation must depend to some extent on his success. Townshend never failed till he attempted the impossible at Ctesiphone. As the man most conversant with the difficulties of the situation, should he have refused to advance on Baghdad? It is not my business to offer an opinion on this question. But in war there is always the chance that the unexpected may happen, and Townshend, an optimist and born, apparently, under a lucky star, took the chance. He made a magnificent fight, but was overwhelmed. He was forced to retreat, and yet, in retreating he dealt the enemy a shrewd blow at Ummal-Tabul. He longed to find a position in which he could stop his retreat—a movement so repugnant to an ambitious commander who had always been victorious. He reached Kut. He

thought he could soon resume the offensive, or at least carry on an active defense and thus retrieve the prestige of his force. He decided to remain. He paid for that decision as a prisoner in Turkey, and a large part of his force paid for it with their lives.

The decision to defend Kut exemplifies the variety and number of the factors which the commander of a force may have to consider, and the extreme difficulty in which he may be placed. Military opinion now appears to incline to the idea that whatever loss of stores, ammunition, prestige, or men, was involved, Townshend should not have defended Kut, and that, though he might have halted in Kut for a few days to rest and reorganize his force, he should then have crossed the river and retreated on Ali-al-Gharbi. It was unfortunate that the old Turkish bridge below Kut was dismantled before he arrived from Ctesiphon. It occupied the best and only proper bridge site from an engineering point of view, and it could have been covered and defended till the British force crossed the river. It could then have been destroyed. No bridge which I could make with my remnants of boats after the retreat, could have enabled a whole division to cross the Tigris. In his retreat towards Amarah to meet his reinforcements, General Townshend would have been greatly harassed by Arabs, but he would have had the Tigris between him and the bulk of the Turkish army until the Turks could construct a bridge, and he would then have had a long start. He might have lost 3,000 men from exhaustion in this retreat, but by staying in Kut he caused, directly or indirectly, the loss of nearly 30,000 men. It is easy to be wise after the event. I think, however, that our force would have been capable of resuming the retreat as far as Ali-al-Gharbi, or even Amarah, after three days' rest in Kut, and in the retreat the 6th Cavalry Brigade and the artillery could have held off the Arabs and the Turkish cavalry. Amarah held considerable quantities of supplies and ammunition. It was only about 280 miles by river from Basra, the main base, so that reinforcements could reach it with moderate speed. It seems probable that we could have reached Amarah in ten days from Kut, before the Turks could have bridged the Tigris and overhauled us. Our shipping, with the most essential supplies and our sick and wounded, could have gone with us in the retreat as it did from Ctesiphon. At Amarah the force would have covered Basra and the valuable oil-fields at Ahwaz, and we should have been nearer to our base, and the enemy further from his.

The garrison of Kut, which was really a covering force for the concentration of the British army gradually assembling in Lower Mesopotamia, failed to fulfil its proper role for the following reasons:—

- (i) Its use as a covering force was neutralized, as its action was to some extent ineffective and it was immobile.
- (ii) It did not, except at first, engage a greater hostile force than itself, though it prevented the advance of a greater force beyond Shaik Saad, 20 miles downstream.
- (iii) It could not rejoin the main body, or be reinforced without the risk of the defeat of those reinforcements in detail.
- (iv) It risked destruction without compensating advantages to the army as a whole.

The Army Commander left to General Townshend, the commander of a detachment, the decision as to whether that detachment should remain at Kut as a covering body, or rejoin the main army. The Army Commander was the officer with whom rested the strategical conduct of the campaign. On him depended the arrangements for the concentration of his army for the offensive. On him devolved the duty of securing space for that concentration. He was a keen and capable soldier, his scheme for the capture of Baghdad had failed, and he had great faith in the ability and judgment of General Townshend. Was it, or was it not, his duty to decide whether a covering force at Kut was essential?

In conclusion I may say that my object in writing on such a very controversial subject is that it illustrates clearly the complexity of modern warfare in which a commander has so often to make a rapid decision of vital importance when swayed by many conflicting considerations. All honour to him who, under such circumstances, is capable of a rapid decision, even though fate decrees that it should lead to disaster, but happy is he whose decision leads his troops eventually to victory.

We have enlarged our freedom, we have strengthened our independence. We have been, and propose to be, more and more American. We believe that we can best serve our own country and most successfully discharge our obligations to humanity by continuing to be openly and candidly, intensely and scrupulously, American. If we have any heritage it has been that. If we have any destiny, we have found it in that direction.
—Calvin Coolidge.

EDITORIALS

The U. S. S. Saratoga

THE Saratoga is the largest, most powerfully engined, and fastest large ship ever constructed in this country. This vessel, recently launched from the yards of the New York Shipbuilding Corporation, in Camden, New Jersey, is the latest word in aircraft carriers. The Battle cruiser Hood is Great Britian's largest ship of war, but the Saratoga's 180,000 horse power, 890 feet of over-all length, and 33.5 knots of designed speed are all in excess of those of the Hood. The horse power of the more modern battle ships is approximately 35,000 but such vessels have a maximum speed of only 21 to 22 knots. Complete with all equipment the Saratoga will cost \$45,000,000.00

As a result of the Washington Conference for the Limitation of Naval Armament, the United States is limited to 135,000 tons of aircraft carriers, Great Britian to a like amount, and Japan, France and Italy to lesser amounts. The Saratoga was one of six battle cruisers authorized for construction prior to this conference, but as a result of it four of these were ordered scrapped. The Saratoga and her sister ship the Lexington, however, escaped this fate and are being converted into aircraft carriers.

It is interesting to attempt to visualize the part such vessels may play in future wars. It is understood the Saratoga has a carrying capacity of seventy-two planes, about thirty of which are to be of the bombing type; most of the others no doubt being combat planes used to convoy the bombers when operating offensively and to protect their own fleet when being attacked. With her great speed the Saratoga, accompanied by cruisers and destroyers, would be able to approach an enemy coast in a minimum of time, launch its planes and drop bombs upon vital areas, and make a quick get away. However, the risk involved and the temporary weakening of the main fleet would hardly seem to compensate for the small gain to be obtained from the dropping of thirty large bombs or a larger number of small ones on enemy utilities. It is reasonable to suppose the

Saratoga and vessels of her type will be maintained with the fleet as essential adjuncts thereto for bombing operations against the enemy's first line ships and for the defense of the fleet itself.

The only other aircraft carrier of the United States is the Langley, a converted collier with a speed of approximately fifteen knots. Such a speed precludes its use with the fleet, so when funds are available for the completing of the aircraft carrier program it undoubtedly will have to give place to a vessel of a more modern type. With four ships of the type of the Saratoga, the United States will have her authorized allowance of aircraft carriers. Great Britain has adopted a different policy, and has constructed vessels of smaller tonnage. Her aircraft carriers already built or under construction at the present time are the Hermes, Eagle, Argus, Courageous, Glorious and Furious, with a total tonnage of approximately 89,000. Others remain to be built. Of these the first three have a speed equal to that of first line ships, but the last three, with their speed of 31 knots, permit their use with cruisers and destroyers. As aircraft carriers do not carry sufficient armor to stand the pounding battle ships must expect to receive in a naval engagement, it is probable the first three will later give place to others of faster speed. Considering the tonnage of the British carriers it is evident England is carrying her eggs in more baskets than is the United States. Although the Saratoga is to be armed with eight 8-inch guns in four turrets, and is, like all other ships of war, to be provided with antiaircraft gun protection, it is hardly conceivable that such armament will discourage a determined enemy from attacking such a large target with submarines, destroyers, cruisers and bombing planes. Of course her speed and her large number of combat planes are factors of safety, but foreign powers have cruisers and destroyers with as great a speed. Moreover, it would seem that a single projectile or bomb striking her flying deck would be reasonably sure to wreck it sufficiently to prevent its again being used until extensive repairs had been made.

Without doubt future naval actions will be fought on the surface of the water, under the water and in the air. It would be interesting to know to just what use naval strategists will put such vessels as the Saratoga during some future Jutland. How many times would planes return to their mother ship for another load of bombs; how many bombs would be dropped during such an action; how many hits would be obtained; how many planes would survive the action; how many planes would be brought down by antiaircraft gun fire, and how many ships put out of action by aircraft bombs? In other words to what extent will the use of aircraft carriers influence the outcome of future sea battles?

The Mesopotamia Campaign

When diplomacy fails nations sometimes resort to war in order to gain their ends. Germany as early as 1900 conceived of a German controlled empire that would extend from the Baltic and North Seas as far south as the Persian Gulf. Such an empire, aside from its enormous commercial advantages, would in time of war divide Russia from Western Europe; control the Dardanelles; threaten the Suez Canal; and menace British communications with Asia. Once knitted together it would be all powerful. Turkey was won to the plan and to a large extent the Balkan states. The construction of the Berlin-Baghdad railroad was undertaken. The creation of such an empire threatened the very existence of England, France and Russia. The Kaiser's diplomats used all their wiles to promote this dream, those of the Triple Entente endeavored to frustrate it. Diplomacy failed. The effort of Germany to establish a "Mittel Europe" was one of the principal causes of the World War.

When Turkey entered the war General Leman von Sanders, a German officer, to all intents and purposes controlled the Turkish armies. He mobilized fourteen army corps, one of which he placed at Baghdad, some fifteen hundred miles southeast of Constantinople. Using Baghdad as a base of operations he proposed, with this corps augmented by native troops, to control the wonderfully fertile Tigris and Euphrates river valleys as far south as the Persian Gulf. The British, however, were not to be taken by surprise. General Barrett had been assigned the mission of protecting the British oil base at the head of the Persian Gulf and in November, 1914, arrived there and established an entrenched camp. General Townshend succeeded to the command and by September, 1915, had moved forward and captured Kut-el-Amara. Baghdad was situated about one hundred and twenty miles to the northwest and he believed it could be captured. The necessary authority having been obtained from the British headquarters in India an advance was ordered. The British found the Turkish forces commanded by German officers in an organized defensive position at Ctesiphon. They attacked but were unsuccessful and in the face of superior numbers were forced to fall back to Kut-el-Amara. The Turkish forces followed and after holding out for several months General Townshend surrendered his command on April 29, 1916.

Later in the year General Maude was placed in command of the British forces in Mesopotamia and after having secured a sufficiency of river transportation moved against the enemy. By maneuvering and fighting he caused the Turkish forces to evacuate Kut-el-Amara in February, 1917, and thereafter pursued the enemy to

Baghdad. After severe fighting in which the cavalry played a prominent part the place was evacuated and the British forces entered March 11, 1917. Thereafter General Maude made his position secure by taking up advanced defensive positions on the Tigris and Euphrates rivers. This ground the British were still holding at the close of the war.

The Mesopotamia Campaign is a campaign of open warfare, such a campaign as any expeditionary force may be called upon to undertake. Recently excellent books have been published regarding it and contain a mine of valuable information for the Army officer. Prominent among these is "My Campaign" by General Townshend and "The Campaign of Mesopotamia" by General Moberly. Elsewhere in this issue of the JOURNAL is published a study by Major E. W. C. Sandes, an Engineer Officer with General Townshend's command, entitled "The Decision to Defend Kut-el-Amara." Those reading Major Sandes' article will be able to form some conception of the nature of the fighting in Mesopotamia, and of the difficulties under which the troops there had to operate. Moreover, the reader will be impressed by the handicap a commander takes upon himself when he decides to bottle himself up within a fortification with no chance to do otherwise than carry on a purely defensive fight.

Defending War

Do army officers defend war? Do they maintain that war is a medicine that should be taken at intervals by civilization? Regarding this a distinguished scholar of one of our best known institutions of learning is quoted as having made the following statement:

It seems to me that if the men for instance who are in the group which we know as the military group, if the men who are in the armies and navies, would simply say "we are delegated to maintain the only known establishment for protecting security, and, this being the only known method, civilization not having yet worked out any other way, it is our responsibility to maintain this system at the highest peak of efficiency"—I believe the response would be very much greater to the appeal which they would make than to the appeal of a professionalized group defending war.

Army officers realize that one of their most important tasks is in addressing audiences in schools, colleges, armories, summer camps and civilian organizations, and that their principal mission in these places is in preaching the necessity for National Defense and the

furtherance of our National Defense Policy. It is not believed that these officers defend war. Most of them however, primarily because of the study of the profession they have adopted, are more or less acquainted with the causes that have produced wars in the past and with those causes that may produce wars in the future. If the army group did not have a keen appreciation of the minimum forces absolutely necessary to maintain our present military policy, and did not, when occasion required, speak on this subject, it is almost certain that no class of people would do so, and that the size of the Army would soon be reduced to such an extent that our military policy would be little more than so many empty words. Army officers as a class are no more anxious for war than is the civilian population, and as a class, they, who have a conception of the horrors of war, are much less apt to be swayed by newspaper propaganda than is the average reader. Better than anyone else, they realize that an army is not maintained to wage war, but to keep peace. They realize that a defenseless nation invites aggression and that proper preparedness by a peaceful nation is very apt to discourage an aggressive one from taking positive action. It seems hardly possible that so many people can be blind to the innumerable wars that have taken place in the past, and blind to the conditions existing today that are fruitful causes for future wars.

Army officers do not defend war, but they do assert that civilization has not yet reached the stage where future wars are not probable.

Battleship Annihilators

[THE SCIENTIFIC AMERICAN]

In the long list of battleship annihilators, the airplane is the latest, and General Mitchell is its prophet. The work of annihilation has been going on for forty years. Periodically, enthusiastic and highly imaginative prototypes of the gallant general have sounded the knell of that hugh, slow-moving, costly contraption, the battleship. Always the mastodon was to be killed by the midget. Always, the midgets were to be "built in swarms"; in swarms they were to "swoop down" upon the bewildered Behemoth; and, as he sank beneath the waves, a new era of naval warfare was to be ushered in.

Yet, strange to say, when the chosen experts of the three leading navies of the world gathered in Washington to arrange a mutual rating of naval strength, they selected, not the torpedo boat, nor the destroyer, nor the submarine, nor the fast scout, nor the swift battle cruiser, nor even the airplane, as the basis of strength. They selected the battleship!

And they made this choice because, although each of these several craft had, in its turn, been heralded as sounding its death knell, the battleship still held its supreme position as the backbone of the navy and the final arbiter of battles; while the "annihilators" had fallen, automatically, into their respective, subordinate positions, as important auxiliaries to the fighting battle line.

The present hullabaloo over the airship-battleship question is strongly suggestive of earlier enthusiasms over cheap "kill-alls" in naval warfare. There was the torpedo boat—small, swift, hard to see, hard to hit, rushing out of the night or the fog, and delivering its deadly torpedo! The answer was found in the torpedo boat destroyer, larger, swifter, heavily armed, and able to keep the sea.

Then the destroyer itself was to succeed where the torpedo boat failed; but an effective answer was found in the rapid-fire, five and six-inch anti-torpedo battery, each gun capable of delivering from six to ten aimed shots per minute at the on-rushing craft.

Next among the annihilators was the submarine; but in the destroyer with its listening devices and its depth bombs was found the annihilator of the annihilator; and in the late war the Grand Fleet did not hesitate to sweep the North Sea, though at times its course was beset with the undersea craft.

And now we have with us the airplane; and, scorning the lessons of the past, its over-zealous advocates are singing the same old swan song and telling the bewildered public and its scarcely less bewildered Congress to consign our battleship fleet to the junk heap; and this for the reason that, at last, it is confronted with a real, honest-to-goodness annihilator.

Well; we think not.

It was our privilege to witness the bombing of the German ships off the Virginia Capes. We saw a small, frail cruiser subjected to an all-day attack by machines flying at a low altitude at which they would never dare to fly in actual warfare. The ship was anchored; she had neither man nor gun aboard. Yet it was late in the afternoon before she slowly went under. The battleship, also anchored and without defense, was bombarded all one afternoon. Next day she was still afloat and but little below her loadline, and it took some hours of further bombing to put her down. We were not impressed.

It is true that planes, bomb-sight and bombs have been greatly improved since then. But so has the antiaircraft defense of ships. The airplane is a most valuable auxiliary in the makeup of a well-found navy. For patrol, for spotting, for scouting, for bombing and for engaging enemy aircraft it will be invaluable.

But it has not "sounded the death knell" of the battleship.

The Regulars Are Coming

[THE CHICAGO EVENING POST]

When the world war broke out the regular army was ready. Handicapped tho it was by lack of numbers, those of the officers who could be spared taught more than the rudiments of leading troops to the thousands who were members of the reserve officers' training camps. And many an old sergeant, given a commission as an officer in the national army, proved invaluable at a time when men with long years of experience were scarce.

Those of the regulars who stayed in the ranks made enviable records overseas, or else played a conspicuous role in teaching the raw recruits in the training camps the little tricks of the army which go to make a good soldier and a "good outfit." And when the war was over they accepted the inevitable demotions cheerfully and faded back into the semi-oblivion to which the United States always consigns the members of its army during the days of peace.

But the regular army is carrying on just as it did in the days before 1917. Not one of its leaders hopes for another world calamity, but each is prepared for unexpected eventualities, as every good soldier should be.

A staff to be effective must possess ability, loyalty, and military character, and, to produce the best results, it must be harmonious. To secure the loyalty of his military subordinates, a commander must set the example of perfect loyalty to his superiors. There is no place in the military profession for envy and jealousy, yet both these exist, and not infrequently. These are human weaknesses, very deplorable, but to be taken into consideration. They have destroyed many fine reputations, and dwarfed the efforts of many characters otherwise admirable.—Major General Hunter Liggett in "Commanding an American Army."

PROFESSIONAL NOTES

General Hines on the Hawaiian Maneuvers

Major General John L. Hines, Chief of Staff, and one of the Chief Umpires at the Hawaiian Grand Joint Exercise recently authorized the following statement:

The Grand Joint Exercise just concluded in Hawaii was the biggest and most interesting one ever held by our Army and Navy. It had two principal objects:

1. To test the project and plans for the defense of Oahu; and
2. To train Army and Navy in joint operations.

The problem for the exercise was drawn up by The Joint Board and was extremely simple in form, although its solution was difficult for both sides. The following facts were assumed:

1. That a state of war existed between Blue (the United States), and Black;
2. That the Hawaiian Islands were a Black possession and were defended by the existing armament; the present naval district forces and a garrison of approximately 14,000 men; and
3. That Blue was desirous of capturing Oahu with the object of making use of it as a Naval Base.

The Blue Fleet, accompanied by an expeditionary force of two divisions of troops, was concentrated in San Francisco and put to sea April 15. Under the terms of the problem, the transports accompanying the Fleet were not to be farther than 1700 miles from San Francisco at 5:00 a. m., April 25, 1925, the hour and date when the problem actually opened. The Black or Hawaiian side was restricted to the use of forces and means actually available, whereas the Blue Fleet had two constructive divisions of troops, represented by some 1500 Marines.

Black knew of the impending attack in ample time and estimated that Blue would seize a base on Lanai, one of the islands of the group, preparatory to launching an attack against Oahu itself. Black was in a difficult situation. No reinforcements could be expected and neither air forces, sub-surface nor fast surface vessels were available in sufficient strength to permit Black to deny any of the outlying islands to Blue. The arrangements made for defense were, in general, admirable and were sufficiently carried out, the conduct of practically all forces engaged being exemplary. Everyone was on the *qui vive*. Possible landing places were held by a thin beach cordon, plentifully supplied with field guns, machine guns, etc., and backed by strong points and small mobile reserves. The Black air forces, both Army and Navy, were concentrated on Oahu, seven DH4B's

being, however, despatched to the island of Lanai. The surface and sub-surface vessels and aircraft of the Naval District formed an observation cordon around Oahu at a sufficient distance to give timely warning of the enemy's approach.

Blue's task was also difficult in that it involved an attack against a strongly fortified island some two thousand miles from Blue's nearest home base. In the very nature of the case, such an attack was a major operation and therefore required extensive and careful preparations. Since a direct attack against Oahu was too hazardous, Blue planned to seize one of the outlying islands, Molokai, and to establish an air base there and to follow this with a naval demonstration against a bay on the south coast of Oahu for the purpose of diverting Black's attention. Blue then proposed to direct his main landing attack against the North Coast of Oahu, while simultaneously therewith making a secondary landing on the west coast of Oahu.

Blue made his dispositions accordingly. Blue was successful not only in seizing Molokai, but Lanai as well and in occupying the landing fields on both islands early on the 25th. This success may be ascribed in large measure to the fact that instead of moving the airplane carrier Langley close inshore and exposing her to attack by Black submarines, Blue kept her well offshore and had her fly her planes off to the landing fields on Molokai and Lanai as soon as these had been seized by the Advance Force. The seven Black airplanes despatched to Lanai gave a good account of themselves, sinking a Blue tender and inflicting serious damage on the Blue landing forces. They were far too weak to prevent the seizing of the two islands.

Black anticipated that the main hostile attack would be launched against the West coast. With the forces at his disposal, it was physically impossible for the Black commander to have adequate local reserves on both West and North coasts, and to hold out general reserves.

Confronting two attacks, one on the West coast and one on the North, he felt compelled to estimate one as the main attack and the other as secondary. The immediate consequences of a successful attack on the West coast were more serious than on the North coast. Therefore, Black placed the bulk of his forces so as to meet this attack. With adequate general reserves to meet any action of Blue this risk would not have had to be taken. As it turned out, the bulk of the Black forces were too far from the North coast of Oahu to repulse the major debarkation promptly.

Blue had been successful in seizing a base in dangerous proximity to Oahu. With local command of the sea and with a superior air force in his hands, Blue was reasonably sure of ultimate victory. But Black aircraft and submarines did all in their power to make winning as hard and costly as possible to Blue.

Blue's first move against Oahu consisted of a naval demonstration on the evening of April 26th. This was designed as a feint but did not have any practical result for it did not deceive Black for a moment and merely served to bring Blue ships under the fire of heavy Black batteries. Blue then launched his main attack against the North (or open) coast of Oahu at daylight on the 27th, landing troops under cover of and supported by heavy fire from his ships. The weather was ideal and there was practically no surf. The landing was vigorously opposed but the defense forces finally had to retire. Simultaneously with this main attack Blue made a secondary landing on the West coast under cover of and supported by, heavy fire from his ships. Here considerable surf was encountered and the landing failed in face of the vigorous defense. It is to be noted that both land-

ings were planned to begin at 1:30 a.m., April 27, but orders were issued that they were actually to begin four hours later so as to obviate the inevitable hazards of life and materiel involved in making landings at night.

Since the bulk of the landing forces was constructive, the arrangements for the landings were extremely complicated, but apparently worked without a hitch. Each boat carrying a large signal flag in the bow as it approached the shore represented a tow of boats. The character of the troops actually or constructively carried by boats was indicated by these flags.

A beachmaster (naval officer) and beach detachment were designated for each beach. Beach parties were debarked in first waves, but not in leading boats thereof.

The aircraft with the Expeditionary Force were to furnish illumination (flares) for beach bombardment and smoke screens to cover first landings; to reconnoiter hostile gun positions and troop movements; to spot for covering and supporting gun fire.

Careful provision was made for marking the extent of each beach and the approaches thereto. A schedule for unloading each transport, showing tows, etc., was prepared on each transport and a schedule of the trips of each tow was prepared by the senior officer of each tow and furnished each boat officer. Each beachmaster likewise prepared a schedule for the troops and materiel to be landed at his beach.

It is of course extremely difficult to say whether either landing would have succeeded in an actual case. The local umpires on the spot were of the opinion that the landing on the North coast succeeded. Blue suffering severe losses, and that the landing on the West coast failed. Considering the two cases on their merits, I am of the opinion that the landing on the West coast would probably have failed in war, but that the landing on the North coast might well have succeeded. There is no doubt that highly trained, well led infantry can establish a beach-head once the troops are ashore. Even when the landings, as in the exercise, are well planned and covered by naval gun fire, the guns defending the beach will sink many boats, perhaps even transports. Even under the best weather conditions, the critical period of a landing operation is that in which the landing troops are moving in boats from transports to beach. During this period they are exposed helpless to the gun, machine gun, and rifle fire of the defender, and in case he has any aircraft left, to attacks by the latter.

But these landing operations demonstrate another lesson. The defense against them must be flexible and mobile. Dependence must not be placed primarily or even predominantly upon mechanical means—field guns and machine guns—but upon mobile troops and aircraft, counter-attacking whenever and wherever necessary. A commander must not only have troops enough to hold the essential positions and to man his armament, but he must have enough troops left to form an adequate reserve. In this instance, the commander could not do this, for his force was not adequate for the task assigned to it. He did all he could with the forces given him; he could not do the impossible.

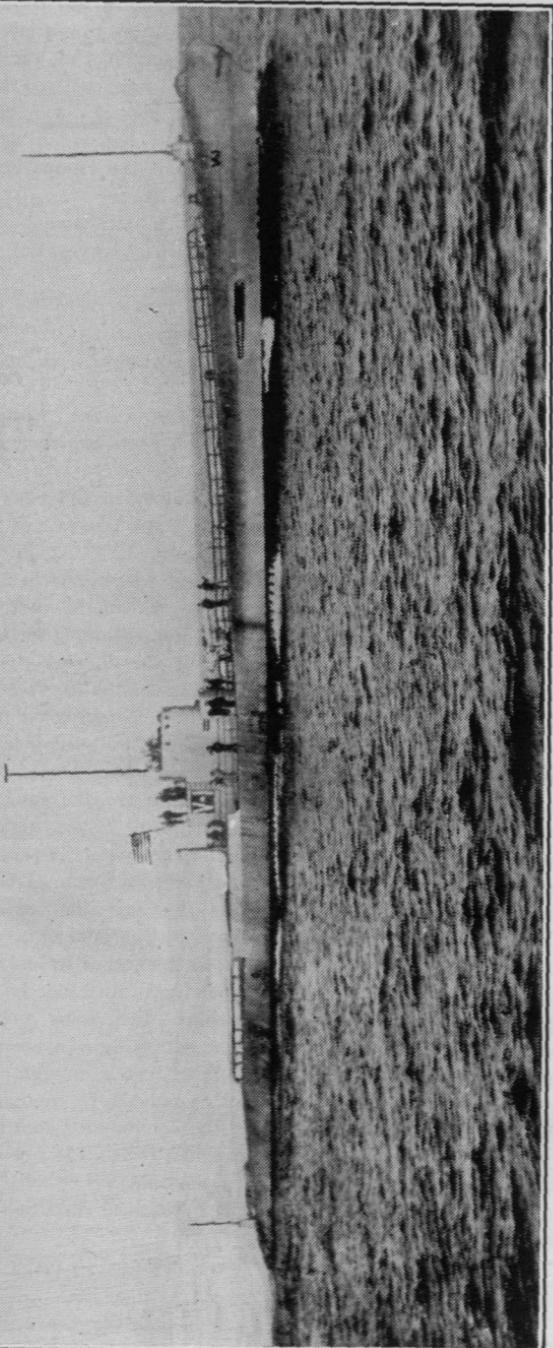
Analyzing the results of the exercises from the standpoint of their objects, it is believed:—

1. That the project and plans for the defenses of Oahu have been tested and that the deficiencies therein have been disclosed.
2. That very valuable training has been given the Army and the Navy in joint operation.

These results fully justify the time and effort spent in the exercises.

U. S. FLEET SUBMARINE V-1

The V-1 recently went into commission, being the first of three large cruiser-submarines authorized for the Navy. Displacement, 2025 tons. Length over all, about 335 feet. Armament: six 21-inch torpedo tubes; one 5-inch, .51-caliber rifle; one 3-inch antiaircraft gun, and two Lewis machine guns. It carries 16 torpedoes. Speed: surface, about 21 knots; submerged, about 10 knots. The V-1 can maneuver with the fleet and is equipped with a complete Sperry Gyro-Compass system. It carries a navy standard 24-foot whale boat and a standard 24-foot motor launch. The crew consists of 7 officers and 80 men. The V-1 is designed to permit its making any voyage of which the whole fleet is capable.



The Coast Artillery Corps and its Relation to Other Branches

By BRIGADIER GENERAL H. D. TODD, JR., U. S. Army

EDITOR'S NOTE: The following remarks have been extracted from a lecture recently delivered by General Todd at the Staff Training Camp, Ninth Corps Area

Among the missions of the Ninth Corps Area, if not the principal mission, is the defense of the Pacific coast from Canada to Mexico.

Any delay or failure in the mobilization and concentration of the military units for operation in a distant theatre in war time might be excused but the Ninth Corps Area will not be excused if invasion of the United States occurs over its coast line.

Coast defense has two meanings—in addition to its meaning the defense of the coast, it also refers to a group of forts provided for the defense of a harbor or point of the coast. In this discussion, coast defense will be considered in its general sense, that is, the expression will mean the defense of the coast in general. Such defense must be planned: (a) To repel naval raids; and (b) To prevent invasion from the sea.

Raids may occur at any time after the declaration of war. Japanese destroyers dashed for the harbor entrance at Port Arthur within a few hours of the time that the Japanese Ambassador at St. Petersburg received his passports.

Invasion will not be attempted until after the enemy has secured temporary or complete command of the sea. Raids have various objectives. They are undertaken to cause fright or disgust with the war, injury to public utilities such as power plants, reservoirs, railroad terminals, bridges, tanks, warehouses and banks, or they may have the direct object of injuring units of our fleet while at anchor within a harbor. They come suddenly. For instance, during the late war, upon the lifting of a fog the heavy and fast battle cruisers of the German navy began the shelling of Scarborough and Hartlepool.

Invasions in force are deliberate affairs, carefully prepared beforehand and, to be successful, the defenders must not only be outmatched but the invading force must find landing facilities for the immense amount of the heavy supplies of an army, including its guns and means of transportation. That is, the enemy must occupy a deep, sheltered harbor with docks, cranes, warehouses and well constructed railroads leading into the interior of the country.

The fortification of an entire coast line is impossible. In fact it is not necessary for the facilities just referred to do not exist except at the principal harbors.

However, as the landing of a quickly moving column within, for instance, a day's march of a harbor might be attempted so that the fortifications of the harbor can be taken from the rear, it is necessary to plan all defenses so as to resist an enemy at all landing beaches, in addition to the principal harbors.

Such a system has been provided; it is known as "A Positive System of Coast Defense." In this system the basic idea is this: "The enemy must be denied access to any landing place upon which he could quickly establish himself in force, but it is not necessary to defend places where a landing would be so difficult that an enemy would be unable to land in sufficient strength before reserves could be brought up in sufficient numbers to dislodge him."

Under this system the line of resistance is the water line and the "strong points" are the important seaports.

For an invasion to have a chance of success the hostile troops must occupy what can be called vital areas. In the Ninth Corps Area these are: (a) The area including Puget Sound and the mouth of the Columbia River; (b) San Francisco

Basin, and (c) The Southern California Area from Los Angeles to San Diego, both inclusive.

We find, therefore, that strong points have been provided at: (a) Puget Sound; (b) Mouth of the Columbia River; (c) San Francisco Bay; (d) San Pedro Harbor; and (e) San Diego Harbor.

Each of these strong points has three distinct missions: (a) To deny the enemy possession of the port and its facilities; (b) To prevent destruction or serious injury by bombardment of the harbor utilities; and (c) To provide an area off the harbor entrance in which naval vessels and merchant shipping will be protected as far as possible against all forms of enemy attack.

If these missions can be fulfilled an invading enemy must make his initial landing elsewhere; that is, on some beach where no facilities exist for getting ashore the enormous impedimenta of an army and hence where he may be defeated by a quick concentration of defending troops.

The Coast Artillery Corps is charged with the service of the fixed and mobile elements of the land and coast fortifications, all railway artillery, antiaircraft artillery and trench mortar artillery. Hence, this Corps is charged with manning the armament and its accessories of the forts guarding the important harbors. It is seen, therefore, that considering the navy as the first line of defense, the Coast Artillery Corps is the principal component of the second line of defense.

The strong points manned by the Coast Artillery must be held; there can be no withdrawal, our important harbors must be made bullet proof and then, if our flanks and rear can be made secure against attacks from comparatively small forces, invasion of the country at large can be prevented with certainty.

It is the mission of the other combatant arms of the Army, (Infantry, Field Artillery, Cavalry, etc.), to prevent such forces from landing on the beach and by short and quick movements, attacking seacoast forts from the rear. Consequently there must, at all times, be the closest cooperation, as is the case in any line of resistance, among all forces engaged.

It was stated above that the Navy is the first line of defense. The mission of the Navy is to destroy the oversea communications of the enemy and protect our own sea communications. The Navy cannot perform its mission unless it has secure bases where it can be guaranteed absolute protection. In other words, the harbor defenses must be capable of fulfilling the three missions described above.

To decide whether or not the harbor defenses manned by the Coast Artillery Corps can fulfill these missions requires an "estimate of the situation." To make such an estimate we study the power of foreign fleets and compare their power with the fixed armament of our seacoast forts and its accessories.

To aid in such a study we have an excellent book called "Jane's Fighting Ships," which is published yearly and which gives an accurate description of every fighting ship in the world. This description includes, in detail, the thickness or armour on the various parts of the ship, the number and caliber of its guns, the weight of projectile, muzzle velocity and in many cases the elevation that its guns can be given. There are also given in this book the number of men composing the crew, the speed of the ship, its fuel capacity and its radius of action at different speeds. In addition to the above data, the book gives the number and kinds of planes carried, not only by the regular airplane carriers but by ships of other classes.

A comparison of this data, with the number and class of the guns in our seacoast forts gives with almost mathematical certainty the estimate of the situation we desire in order to decide whether or not our harbor defenses can fulfill the missions assigned to them by the War Department.

Reference has been made to the accessories of the fixed armament in the seacoast forts. Under this heading are grouped the mines, the searchlights, the mobile guns, both of the heavy field and railroad type and such units of the Air Service as may form the garrison of the harbor defense. The highly technical nature of the duties of the personnel forming the garrison of seacoast forts requires not only long training but ability to master at least the elements of civil, mechanical, electrical and steam engineering. To obtain a working knowledge of ordnance and gunnery one must know the elements of chemistry of explosives, interior and exterior ballistics, includings a knowledge of the simple problems in trigonometry.

It is seen, therefore, that an efficient Coast Artillery Corps cannot be produced in a few months. The complex duties of officers and men in the garrisons of seacoast forts require hours of study on the part of the officers and many hours of drill on the part of enlisted men. At present the second line of defense of the country is weaker than it has been since before the Spanish War and even if men and material were supplied it would take at least a year to make it sufficiently efficient to repel naval raids and prevent invasion from the sea.

The remedy for such a condition lies to some extent, if not to a large extent, in the hands of the Organized Reserves. Owing to their number and their contact with the civilians throughout the country they can inform them of the condition exactly as it exists and also indicate the method of improvement.

Rating Coast Artillery Batteries

By LIEUT. C. E. BRAND, C. A. C.

Coast Artillery Memorandum No. 1 (now rescinded and replaced by certain other regulations) enumerated certain factors by which *Coast Defense Commanders* should judge the comparative excellence of their batteries in artillery firing. The first factor, "hits per gun per minute" upon a prescribed hypothetical target, is susceptible of exact and unquestioned determination. The remaining seven factors may be more or less exactly determined. This is certainly superior to the former system of rating, upon broader generalities, though both systems are equally certainly based upon fair and correct artillery principles. Even the latter, however, is fatally defective in affecting really competent and unbiased ratings based upon demonstrated proficiency in artillery firing in that an exact percentage of importance should be assigned to each factor; an exact method should be prescribed whereby it could be ascertained what percentage of the allotted comparative value of any factor is merited by any firing battery; and the artillery district commander, who actually does the rating, should be bound by the prescribed rules instead of merely the coast defense commander. Such a system of rating would give the battery commander a definite goal of accepted recognition of merit to reward his efforts (or lack of it to condemn his failure) and would establish at once a relative scale of ratings on the same basis for the entire corps.

Using the factors enumerated in Coast Artillery Memorandum No. 1 referred to above as a basis, the following scheme of factors and weights and methods of determining the points of each factor rated by any particular battery is proposed as possible. Better and simpler schemes can doubtless be devised, but this is the idea:

(1) Shots per gun per minute, considering the type of gun and range and course of target: Weight 10 points.

- (2) Mean longitudinal and lateral deviations of shots: Weight 10 points.
- (3) Mean longitudinal and lateral errors of shots: Weight 10 points.
- (4) Extent of personnel errors: Weight 50 points.
- (5) Correctness, smartness, and smoothness of drill; general appearance of personnel: Weight 5 points.
- (6) Condition of battery material: Weight 5 points.
- (7) Solving the firing problem: Weight 10 points.

Total weight: 100 points.

It will be noted that in the above the factor "hits per gun per minute" is changed to "shots per gun per minute." While it is desired to give credit for a rapid rate of fire, under the conditions explained in the rules, this change will prevent rewarding or penalizing a battery because of any particular manifestation of the laws of probability in the case of the few shots which it has to fire. This in no way modifies the accepted proposition that the *mission* of the Coast Artillery is to secure *hits*; not merely to fire shots. And the test of any such set of factors as the above must in fact be the extent to which a high score made under them indicates directly the ability of the firing battery to secure the maximum in "hits per gun per minute,"—*in the long run*.

The following scoring rules for major caliber guns are suggested. Similar rules varying in minor particulars would be necessary for mortars, for rapid fire guns, for mine companies, antiaircraft companies, etc., the principles remaining the same for all.

The prefixed numbers indicate factors, as tabulated above, which are not repeated and must therefore be referred to in each case.

- (1) *100 per cent conditions:* Range above 16,000 yards, or 80 per cent to 100 per cent maximum; course curved at least 15° each 1000 yards; speed not less than 21 knots; 1 shot per gun per minute.

Deductions: For each 10 per cent or each 2000 yards average shorter range down to minimum of 10,000 deduct 10 per cent of points scored. For $10^\circ - 15^\circ$ course (i. e. for course curved at from 10 to 15 degrees per 1000 yards) deduct 5 per cent of score made; for $5^\circ - 10^\circ$ course deduct 10 per cent; for $1^\circ - 5^\circ$ course deduct 15 per cent; for less than 1° course deduct 20 per cent. For speed less than 21 knots deduct 2 per cent for each knot reduced down to 9 knots, which is the minimum allowed. Hypothetical target may be used if actual target of high enough speed cannot be secured.

Total elapsed time will be taken as prescribed in Coast Artillery Memorandum No. 1. It will be noted that no time is allowed for slow spotting, which implies that the battery is responsible for its own spotting. Notation of defects in material for which time is taken out, will be supplemented by a statement from the local ordnance officer that the defect in fact could not have been foreseen by the battery commander and by a copy of a letter from the fort commander reporting the defect to the Department Commander for such remedial action by the department ordnance officer as may be necessary.

- (2) Deduct 1 per cent for each 3 yards and for each $.01^\circ$ over two-thirds the probable error of the piece (the latter to be uniformly prescribed for all similar cannon).

- (3) Deduct 1 per cent for each 3 yards and for each $.01^\circ$ over two-thirds the probable error of the piece.

- (4) This refers to errors in observing, computing, and applying firing data. Any other irregularities come under "correctness of drill." The following records must be kept as a basis for the analysis:

Azimuths read by B' and B" readers.

Azimuths set by arm setters.

The plotted course of the target properly marked so that it may be replaced on the board.

The range to the setforward point called off by the plotter.

The azimuth of the setforward point called off by the arm setter.

The range used by the Pratt Range Board.

The range and azimuth used by the wind component indicator.

The range and azimuth used by the deflection (or azimuth correction) board.

The meteorological message.

The several corrector settings on the Pratt Range Board.

The reported deviations, longitudinal and lateral.

The corrections ordered from observation of fire.

The correction settings used on the time-range and time-azimuth boards (arbitrary and ballistic separate if so kept).

Traces of the curves made on these boards.

Corrected ranges and azimuths called off to the guns.

Ranges and azimuths received at each gun.

Azimuth displacement corrections received at guns (range corrections should be painted on the emplacement).

Setting of guns in both range and azimuth marked with pencil or chalk on the range drum and racer the instant before firing.

These records should be supplemented by whatever others may be necessary to cover any special methods used and to insure that each individual operation in the computation and use of all firing data is completely checked.

No errors will be considered unavoidable except failure of the plotter to locate the actual future position of the target as the setforward point under conditions when a change in course or speed occurs which is not clearly foreshadowed by its preceding plotted positions. When a change is so foreshadowed reasonable latitude (up to 100 yards with fast moving targets) should be permitted in the prediction. The fire commander shall be the judge of the plotter's errors as to the proper travel and direction of target course adopted as the basis for the prediction.

100 per cent conditions—No resultant avoidable error greater than 10 yards in range (30 yards for spotting) nor $.03^\circ$ in azimuth.

For each resultant avoidable error in 10 shots within 30 yards in range (60 yards for spotting) or $.10^\circ$ in azimuth (this to be computed as result in change in firing data finally set on gun) or multiple thereof, deduct 5 per cent, provided that deduction for any one shot in 10 shall not exceed 10 per cent, and deductions on account of one man shall not exceed 20 per cent. However, the maximum deductions possible under these provisions shall be made.

The coast defense or district commander shall hold prior to the firing a technical inspection of each battery during which it will be required to hold a drill on a hypothetical curved course at not less than 21 knots speed unknown to the battery personnel. All the processes involved in firing will be gone through as nearly as possible and not less than 10 simulated shots fired. This drill will be analyzed just as prescribed for firing problems, and the rating upon errors made determined in the same manner. Fifteen of the 50 points allotted to personnel errors will be determined from this technical inspection. If additional firing problems are held this technical inspection preceding such additional firing problems may be dispensed with at the option of the coast defense or district commander and the entire 50 points based upon the actual firing.

(5) This will be determined by the coast defense commander who will make a careful inspection of the firing battery immediately before and during the firing. Defects will be called to the attention of the battery commander and points allowed each of the several batteries announced in orders.

(6) Same as (5), above.

(7) Use of correct methods by the battery commander will count 50 per cent and the actual attainment of the end will count 50 per cent. Errors in fire adjustment will be charged against this item.

The coast defense commander after his annual critique will announce the ratings of all batteries in his command itemized under the above heads and by totals.

All organizations making a total of 80 points or more will be classified as *Excellent*; those making 70 or more, but less than 80, *Very Good*; those making 60 or more, but less than 70, *Satisfactory*; those making less than 60, *Unsatisfactory*. A battery whose rating is unsatisfactory will be required to write a letter through channels to the artillery district commander explaining the cause of failure to attain a higher rating.

The Human Element versus Mechanical Devices

Combat is carried on by two main elements, i.e., (1) Man or the human element and (2) Mechanical devices. Mechanical devices are worthless without men to employ them. Mechanical devices cannot win a battle. The decisive factor in battle is man. The race that has developed most in the leadership, mental, moral and physical qualities of its man-power will win against another race whose strength rests on a great development of mechanical device. In all walks of life as well as in combat, man has always and always will be able to compete with and dominate the instrument of his own creation. No one who has faced battle in its real aspects will dispute this assertion.

The Meuse-Argonne is the greatest battle America has ever fought. One million American soldiers fought in that battle under their own leaders. The battle was a continuous fight for 47 days and nights and may be divided into these periods:

First, September 26 to October 2—6 days, average of 7 miles advance made.

Second, October 3 to October 31—29 days, average of 6 miles advance made.

Third, November 1 to November 11—12 days, average of 50 miles advance made.

The battle was won in the second period.

For 29 days and nights, the American man and the German fought continuously, in rain, in cold, with guns, with gas, with rifles, with bayonets and even with fists. In fact there were constant hand to hand battles in this period. Here was the test of the opposing leadership, mental, moral and physical qualities. Here the American defeated the German man. There was no test of German mechanical device against American mechanical devices. These were on a par. At the end of the 29 days the German man ran away not because he lacked artillery, gas, machine guns and other mechanical devices, but because his mental, moral and physical qualities—his manhood—was defeated and subdued.

It is a common fault, associated with the piping times of peace, to forget or overlook such vital lessons. Our natural tendency is to stress the value of mechanical devices and forget the supremacy of man on the battle field. Our newspapers and magazines since the war have been filled with the mechanical

side of war. Daily you read of the wonderful development in aviation, in tanks, in long range guns, in chemicals. You read predictions of the great destructive effect of new gas, new bombs, etc. When and where do you run across articles touching upon the real vital factors of war, leadership and the mental, moral and physical qualities of our manhood? Have we these qualities in such superabundance that we may neglect cultivating and training them in our manhood?

I fear manhood and citizenship education is too often submerged by the great commercial, industrial and financial development going on in our country. I hope our colleges and schools will not be blind to our present tendencies. I hope they will always insist upon the predominance of the human element in all educational work. With a sound manhood and loyal citizenry, we need never fear for our commercial, industrial and financial problems.—*Extract from address by BRIGADIER GENERAL HUGH A. DRUM.*

The Mysterious Weapon

By LIEUT. COL. WESTON JENKINS, 390TH INFANTRY

[REPRINTED WITH PERMISSION FROM THE *Infantry Journal*.]

It is a curious thing how certain traits in human nature produce the same recurring fallacies from generation to generation. Certain superstitions such as walking under a ladder, starting a journey on Friday, thirteen at a table and so on, persist even when we know better. Like Mark Twain we don't believe in ghosts but we are afraid of them just the same.

One of these ghosts that will not be laid is the spectre of the mysterious weapon. One never just knows what it is, but its devotees are positive that it is deadly beyond anything yet conceived. No one can be found who has seen it, yet that to these believers in ghosts is certain proof that it exists.

This ghost of the mysterious weapon dates back to the beginnings of history. Then, as now, it was probably used as propaganda to frighten the enemy. King Arthur had Merlin with his incantations and enchantments. His good sword "Excalibur" ranked high in the category of mysterious weapons. All through the Middle Ages necromancy figured in war. The first use of cannon was to frighten the enemy. The Japanese used to wear frightful masks to strike terror to the hearts of the foe.

At the battle of Bladensburg in the war of 1812 the British worked on the fears of the American militia with reports of a mysterious and deadly rocket. This succeeded so well that the militia broke and ran from the field after sustaining a loss of only a few men.

At the commencement of the World War, there were persistent rumors of a great and deadly secret that was to be resurrected from the archives of the British War Office. This secret had been deposited there years ago and was only to be looked at when England was in the last ditch, when everything else had been tried and had failed. It was so terrible and deadly that all knowledge of it had been suppressed. Of course, it never appeared. When England and France were in the last ditch, it was the Americans they called upon, not the mysterious weapon.

Another of the same sort was the mysterious French gas we heard so much about early in the war. A drove of sheep, we heard, had been turned loose in a pasture, a shell dropped near them, and when the correspondents came up, there were the sheep like Senacherib's hosts, scattered and strown. Not a mark on them, but all dead as Judas Iscariot.

The believers in necromancy are not all dead. There are still those who preach the gospel of the mysterious weapon which will annihilate thousands with a breath; a mist which falling from the sky will poison a countryside so that not one living thing will be left, not a blade of grass, not a worm, not even a germ. They have not seen it, but they have heard of it. It will make war impossible.

Now I do not doubt that there are some very deadly gases which may be used in future wars. I do doubt, however, that there is a gas which can be produced in quantity which will kill by a touch. I doubt that there is in nature any such store of poisonous material which can be extracted without a prohibitive amount of labor and expense, which might be put into other military agencies with better effect.

In this same line an ingenious electrical expert once figured that the United States could be rendered invulnerable by surrounding it with a deep belt of electrical flame, something on the same order as Dr. Steinmetz's artificial lightning. No enemy could penetrate this wall of living fire. Putting aside the obvious defects in the system such as the destruction of the feed wires by artillery and the vulnerability of the complicated apparatus to airplane attack, it was figured out how much such a system would cost for our extensive frontier and the amount of electrical power necessary. I do not remember the figures, but the amount of money it would cost would bankrupt the world and the power required was more by many times than all the sources of power available in the world.

The diabolical ray, vibrations of the ether, necromancy, and all similar ideas belong to fiction, not to the stern business of war. There has never been a war won by them yet and there never will be a war won by them. Wars are won by the will of the peoples fighting them and by no other method. There is no royal road to victory. Hard work, fighting ability, training, equipment equal to the enemy, and above all the will to win, the will to endure, to suffer, until the goal is reached, by both the soldiery in the field and the citizenry at home. These are the ingredients of victory. There is no mysterious weapon that can overcome the unquenchable spirit of a determined people. The more energy put in side issues like these, the more taken away from the main issue, the destruction of the enemy armed force. These things are in the nature of dispersion of force, the cardinal military sin. Battles are won by hard fighting and intelligent leading. The brunt of the fighting that is now, that has been in the past, and that will be in the future, is done by the man on foot and the most terrible weapon yet known to man is about five feet eight inches long and weighs about one hundred and fifty pounds. It is known as the American Doughboy.

Now, my object in writing this is not to pooh-pooh the possibility of the invention of terrible implements of warfare, nor is it to minimize the dangers of war. "War is hell" and we know it from personal experience. Not the experience of a personally conducted tour, but the experience of months of hardship and constant danger. My object is to present the subject in its true relation to our national defense, to guard against giving such theories too much weight in shaping the course of our ship of state.

There are those who would frighten the country into one or another policy in the search for the prevention of war, not by our judgment whether such a policy is wise or not, but by high pressure sales methods, scaring us with the vision of a world desolated by man's inventions. The same method that is being used by the vendors of patent medicines who first describe some ordinary symptoms man is heir to, then tell what terrible diseases these symptoms foretell. When the individual feels all hope is gone, the remedy is sprung: "There is Hope"—"Dr.

Knownothing's Remedy." Not only that but this same vision is used as an argument why we should scrap our entire system of national defense. If I believed in these mysterious weapons, it would seem to me the logical thing to do would be to study them, to understand them, and to contrive a defense against them, for maybe some naughty nation some day might use them against us.

A weapon which seems terrible today is commonplace tomorrow. Julius Caesar would have thought a blunderbuss a terrible invention and would be of the opinion, probably, that there was no defense from it. George Washington would have thought the machine gun with its stream of bullets would forever make the attack impossible. Yet, we have found the way to overcome them. Gas would have confounded Napoleon in his day. Yet, we have found the defense against it.

Give one man a sword and put him up against an unarmed man and two seconds will decide the fight. Give the other man a sword and you have an entirely different condition. Give them shields and armor, and the fight will be a long drawn out affair.

Early in 1914 a very clever man wrote a book proving that war was impossible. He had it all figured out. So many machine guns shooting so many bullets per minute; so many field guns shooting so many shrapnel, each with so many pellets, no one could live in the tornado. His prediction was that at the first encounter there would be a puff and then both sides would be annihilated. The nations would stand aghast and the war would cease then and there. We know now how silly this prediction was. Yet we also know that others are now talking the same old story and years from now still others will be repeating it, though it be disproved one thousand times.

It would do no harm to believe these fictions if that was all there was to it. But that is not all there is to it. If people believe them they will get panic-stricken and depend upon equally false ideas to protect them from these terrors. The safety of our country cannot be entrusted to any such wild thinking. It rests now as in the past and will rest in the future on the courage, will, and ability of our citizens to face with a stout heart, whatever vicissitudes fate has in store for us.

Small Arms Target Practice—1924

A bulletin was recently issued from the Office of the Chief of Coast Artillery tabulating the results of small arms target practices, both rifle and pistol, of regular organizations of the Coast Artillery Corps for 1924, and commenting upon the same. On the whole the results were not considered satisfactory, the majority of units having failed to attain the 80 per cent qualification standard as required by the War Department. Some of the units that did attain this standard fired only a small percentage of their personnel, and other units postponed the target practice season until so late that weather conditions precluded making any sort of showing.

The Chief of Coast Artillery in the Bulletin stresses the point that small arms firing is *important* and that it is expected that, considering the ease of the courses fired, organization commanders will qualify at least 80 per cent of their commands during the 1925 target practice season.

The bulletin states "It is believed that little difficulty will be experienced in qualifying 80 per cent, or better, of an organization if preliminary work is conducted during the season allotted to gunners instruction. A small amount of daily instruction in holding, squeezing, adjustment of slings, bolt manipulation,

use of sights, and gallery practice given properly during this period will be highly beneficial and should not interfere with the instruction of gunners. And if the period can be followed by range work there should be no difficulty in attaining a proper standard."

Army Regulations states "Under ordinary conditions the regular practice season for the Regular Army will cover a period of six weeks for each organization." In connection with this the bulletin has the following to say "It is considered that, for 80 men firing on a five-target range, a total of 10½ days is sufficient for range work in firing Course "C" as laid down in T. R. 150-10, *provided they have been properly instructed* in accordance with the principles laid down in training regulations. This includes both instruction practice (9 days) and record practice (1½ days) and is based on allowing 18 minutes for firing ten shots slow fire and changing relays in instruction practice and 13 minutes in record practice; and five minutes for firing ten shots, marking the targets and changing relays in rapid fire both in instruction and record practice. More time is of course desirable but this length of time will permit a four battery regiment to complete its range work (except supplementary) in six weeks and with creditable results. The allowances of .30 caliber rifle ammunition have just been reduced to 160 round for unqualified men and 110 rounds for requalification, and pertinent training regulations are to be changed accordingly. This will materially reduce the time necessary for range work."

The bulletin commends the following organizations for excellent results attained, not only on account of the percentage qualified but also because of the high rating of the men who were required to fire.

91st C. A. (P. S.) (H. D.) Fort Mills, P. I.—Rifle.

3rd C. A. (H. D.) Fort McArthur, and Fort Rosecrans, California—Rifle.

62nd C. A. (A. A.) Fort Totten, New York—Pistol.

61st C. A. (A. A.) Fort Monroe, Virginia—Pistol.

The bulletin tells of a small arms firing report just received from one regiment in Hawaii. The record made by this regiment is far superior to its 1924 record, both as to percentage qualifying and as to the number completing the course. The Commanding General of the Hawaiian Separate Coast Artillery Brigade, in forwarding this report, stated "Exceptional results have been obtained by this regiment in small arms firing. This is very gratifying and is attributed to the slogan '100% must be the objective in every activity,' and to the intelligent and explicit following of training regulations."

The Chief of Coast Artillery believes that if T. R. 150-5 and 150-10 are carefully and intelligently studied and the principles outlined therein are followed explicitly, Coast Artillery units will attain excellent results in small arms target practices.

Fort H. G. Wright, N. Y.

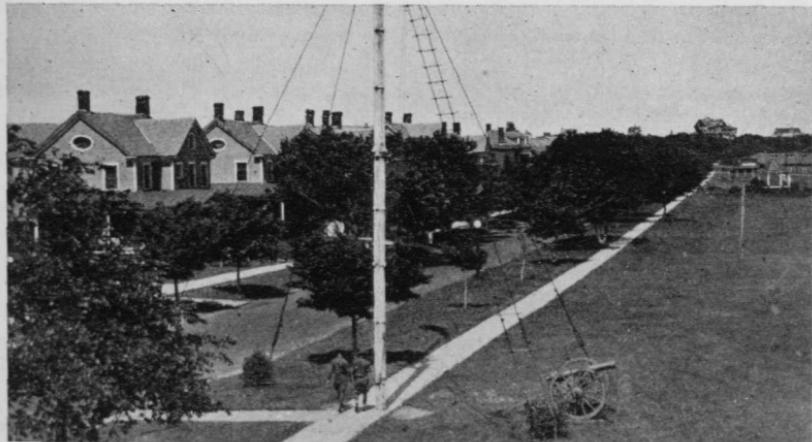
By CAPTAIN F. S. SWETT, C. A. C.

Fort H. G. Wright, N. Y., is located on Fishers Island, in the eastern end of Long Island Sound, a few miles from New London, Connecticut.

The island was first visited in 1614 by a Dutch navigator, one Captain Adrian Block, who having named the larger island a little further east after himself, may have honored a companion of the voyage, Visscher, by naming this previously unnoted island after him. Fishers Island probably, however, was so named because of its position in the early fishing grounds, as the present Montauk Point at the end of Long Island was formerly known as Fishers Hook.

The Pequot Indians who originally occupied the island were driven out in 1637 by combined forces of the English, Mohegans, and Narragansetts, and the great battle of that time in connection with later grants by the General Courts of Massachusetts and Connecticut resulted in its acquisition by John Winthrop, Jr., who in 1644 further justified his holding by purchasing proprietor rights from the Indian inhabitants. With his family he actually lived on Fishers Island at intermittent periods in a house which occupied the present site of the Mansion House until May, 1647, when he moved to New London.

The island legends indicate the usual trouble and strife with the Indians, although no serious encounters occurred subsequent to the eviction of the Pequots in 1637. Captain Kidd, the notorious pirate, operated in the surrounding waters during the late sixteen hundreds, and many a spadeful of earth has been



OFFICERS' ROW—FORT H. G. WRIGHT

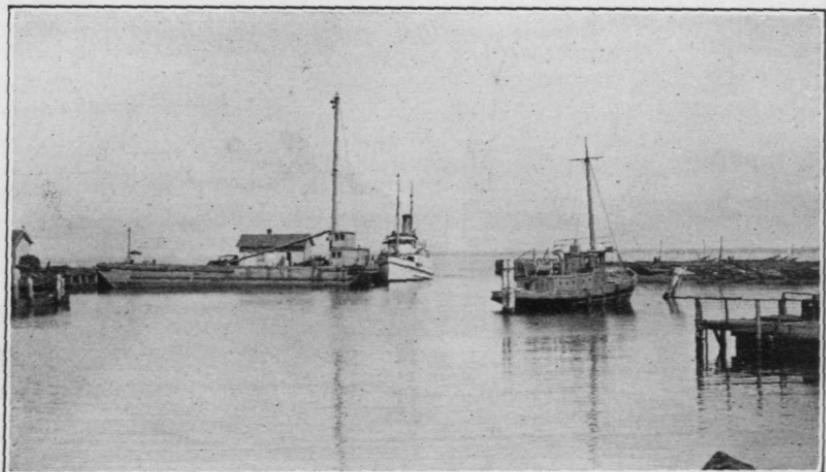
turned on Fishers Island in vain search for his hidden loot. Being located in a main path of navigation and so close to the early settled colonies, the island was frequently involved in the many struggles and disputes between the Indians, English, French, and Dutch.

The strategic importance of Fishers Island was recognized in colonial days. There was advocated in 1690 and executed in 1704, the establishment of a signal beacon on Prospect Hill to give warning of the approach of an enemy on New London. To quote, "and whereas there is a former order of council for the keeping of a ward upon Fishers Island for the discovery of an approaching enemy in order to give a more timely notice to New London by fixing one or two beacons made on said island for that account it is now ordered that the beacon made on the west point of Fishers Island shall be fired upon discovery made from Mount Prospect of one ship, or two other topsail vessels standing in towards said island from the southard or northard of Block Island or upon discovery of five ships standing in from the southard or five from the northard of Block Island, and that both beacons on Fishers Island shall be fired upon the discovery of a greater number of vessels standing in as aforesaid."

In 1898 the Government purchased a tract of 261 acres at the western end of the island for the establishment of coast defense fortifications, and construction of

battery emplacements began almost immediately. Later on it developed that Prospect Hill and North Hill afforded necessary tactical advantages and they were added to the reservation. The post was named after Brigadier General Horatio Gouvernour Wright, a retired Chief of Engineers, who rendered distinguished service to the Union in the Civil War. Built at a cost of approximately eight million dollars, it became the headquarters post of the Coast Defenses of Long Island Sound, with Forts Terry, Michie, Trumbull, Mansfield, and Tyler as units in the command. The last three have since been abandoned.

The post is necessarily self-reliant with respect to its electric power and telephone systems, and practical working knowledge is obtained by the many operators under actual conditions of service. Theoretical training is greatly augmented by practical experience.



BOAT HARBOR—FORT H. G. WRIGHT

Fort Wright is happily situated with respect to facilities for amusement. The civilian portion of the island has in late years developed into a popular summer resort, and throngs of vacationists furnish means of a multitude of diversions throughout a large part of the year. New York and the large cities of New England are so closely adjacent as to make reasonably accessible their many and varied programs of sports—major league baseball games, the more important football classics, boat races, etc.

Command Qualities

In chapter II of the Mailing List of the General Service Schools for December, 1924, appears a discussion of the Command and Staff organization of a division. The "command qualities" of the Division Commander, appear to apply so well to commanders of smaller units, even battery commanders, that they are published below.

Qualities essential to the successful exercise of command can be grouped under the two general headings: (1) personal characteristics, (2) professional knowledge and training.

The commander should possess high moral and physical courage. He should be just, upright, and human. He should be honest and frank, yet tactful. He should possess personal magnetism and the quality of eliciting confidence from his subordinates. He should possess good health, a robust physique and a commanding presence. Slovenliness in attire, negligence in obligations, boorishness in manners, and vulgarity in speech are all deficiencies that will impair leadership in a commander much as they do in any of the walks of civil life. The commander should be of generous mind, quick to recognize and acknowledge merit in his subordinates. He should be self-controlled in all situations. He should have confidence in himself and imbue his command with confidence in him. He should be eminently just and absolutely genuine. Nothing can be more inimical to a commander's influence over his subordinates than a prevailing sense that he does not believe in himself, is acting a part, a poseur. He must school himself in the habit of straight thinking and of estimating things at their true value. Decisions, the crucial tests of military worth, are founded on reason and judgment which are only the result of the comparison of well weighed ideas. He must possess that quality of marshaling and bending to his own ends the energy and capabilities of others. And above all else, the commander must know his profession.

The habit of command augments both the efficiency of command and the power of leadership. The experienced commander frequently succeeds better than the inexperienced by reason of this fact alone. He has become accustomed to the exercise of command, and exercises it as of right. The manner, the voice, the atmosphere of the commander must carry with it the expectancy of obedience. Without arrogance, egotism, or incivility, he must demand of those he would have support him as if that support were already his. But he should studiously avoid dictation; men of intelligence instinctively resent a dictatorial attitude on the part of a superior, and frequently a suggestion will claim inspired loyalty where autocratic command will result only in disinterested obedience.

The commander should be accessible to his subordinates and should sedulously avoid creating the impression that he is unapproachable. He should constantly bear in mind that no man has so firm a grasp on his business or has attained to such complete understanding as to warrant deafness to the opinions of his subordinates. Nor is this willingness to listen to the opinions of his subordinates necessarily inimical to his authority as a commander or to the unquestioned obedience to his orders which he must exact. Many commanders have, upon occasion, failed of right decision because some subordinate, not with sinister intent but because of instilled force of habit or the instinctive feeling that communications were unwelcome, has held back information which, in frankness, should have been theirs. The commander who inspires his subordinates to speak out ever with frankness, who never upbraids them for faulty opinion, who never ridicules them, who encourages their personal confidences, has a hold on them that is difficult to shake. The commander who listens with consideration to the opinion of a subordinate binds that subordinate to him in the most effective manner.

The commander should always be careful to treat his subordinates with the utmost consideration. Nothing but resentment can spring from inconsiderate treatment, and a subordinate filled with resentment is a sometime laggard, or a disloyal servant.

The commander should never appear in the guise of a fault finder and should discriminate between constructive criticism and petty nagging and fault finding.

Neither is it necessary nor desirable that he should correct every infraction or that disciplinary measures should be imposed for every shortcoming. But when punishments are necessary he should make it plain to the offender that it is not he who punishes, but the law of which he is the representative.

The commander should be quick to recognize merit in his subordinates, and should be constantly on the alert for meritorious cases where reward or commendation should be bestowed. A word of praise or a letter of commendation from the commander himself, not from his representative, has a wonderful psychological effect and is a powerful factor in gaining that influence so essential to command. The more arduous the service the greater the necessity for praise and commendation. The successful commander should understand the psychology of praise.

The commander should be loyal to his subordinates, for no commander can expect loyalty from his subordinates unless he carries conviction of loyalty to them. In leadership there is an inviolable law of reciprocity. The commander must fulfill to his subordinates his obligations. He must be the guardian of their rights, vitally concerned for their welfare, their successes, and their happiness, and sympathetic in their misfortunes. He must guarantee to every man his full rights and exact from every man the full performance of his duty.

Brief Description of Signal Corps Development Projects

By Major L. C. BENDER, S. C.

FIELD AND OUTPOST WIRE—Just prior to the formation of the A. E. F., a new type of outpost wire had been developed and furnished organizations which tests had shown superior to wires previously used. Quantity production was obtained during the war but serious criticism from the A. E. F. soon followed because the wire would not maintain its insulation resistance when used for long periods of time as required in stabilized warfare. It became necessary to increase the thickness of rubber wall with consequently increased size and weight of wire to meet this criticism. The French, English, and Germans used wire much lighter and smaller than our modified standard which gave satisfactory service but it was made by processes peculiar to the Continent. American wire manufacturers are not equipped to turn out similar wire, could not so equip themselves except at large expense, and are unwilling to assume the burden of such plant additions when the demand is so limited and intermittent. Several of the largest of these producers have attempted to obtain equivalent results by variations of their processes but without success. All have virtually given up finding a solution for the problem save one who has recently submitted a very promising sample. Close contact is being maintained with this one and tests are under way of his product. The process used is peculiar to this one manufacturer, is patented, and even if entirely successful, competition and large quantity production for emergency may still be lacking. But if any American manufacturer can make a wire meeting the requirements, it will be an advance over present conditions.

FIELD TELEPHONE—There are three types of field telephones now authorized for issue: i. e.—the EE-5 which is the commercial product (1375B) of the Western Electric Company used by Field Artillery and Cavalry; the EE-4 commonly known as the camp telephone Model A, and the EE-3 similar to the EE-4 but having a signal buzzer in addition. The latter two are used by all other services. The ideal is to provide a single type of telephone for all purposes. It has not been possible to accomplish that end due to the legitimate differences existing in

the type of transmitter and receiver needed by the services. It has been possible, however, to design a single type of box containing all the apparatus except transmitter and receiver so that any type of transmitter and receiver (head set, hand set, breast transmitter, etc.,) can be supplied, carried in a pouch on the carrying strap and quickly connected for use by means of plugs and jacks. This model known as the EE-8 has been under trial by all the service boards and will soon be again submitted after completion of what is hoped will prove the final modification to meet objections by these Boards.

SOUND RANGING FOR ARTILLERY—Near the close of the war, the Bureau of Standards devised a system of sound ranging to determine the position of hostile artillery based on the use of sensitive telephone transmitters as outpost listeners instead of the heated grid outpost of the Bull-Tucker system used during the war. Record was made on a smoked cylinder instead of a photographic film. A redesign has been produced which embodies the best features of both systems. It uses microphones of improved design as the listeners, an improved high speed camera for recording, and a redesigned control switchboard. The new design extends the possible distance between control switchboard and listeners by three or reduces in the same ratio the weight of wire required for a given distance. Successful operation has been demonstrated at Aberdeen Proving Ground and Camp Eustis, Va., during the past year. Slight modifications have been completed at the suggestion of the Coast Artillery Board and the equipment goes to Camp Eustis again about April first for further service use.

TIME INTERVAL APPARATUS—The time interval apparatus employed in fixed fortifications is not suitable for use by mobile heavy artillery units and a compact design for this purpose was undertaken at request of the Coast Artillery Board. Two models were constructed and submitted for trial some months back. One employed a novel form of clock with mechanical power amplifier as the motive power and the other a motor with automatic speed governor driven from a storage battery. Although the former was the more accurate of the two, the Board expressed a preference for the motor driven apparatus on account of the ease with which the time intervals could be varied by control of speed, this feature having some promise as a simple means of applying fire corrections. A second motor driven set is being constructed using a better motor, having a wider variety of time intervals, and means for applying the time signal to the telephone circuit to avoid the necessity for special time interval circuits. This model will shortly be ready for further trial.

MONOCORD SWITCHBOARDS—At the close of the war, a survey of equipment then used was made and officers with field experience in the A. E. F. agreed that the 4, 8, and 12-line monocord switchboards could be materially improved in design. The new features included omission of the fuses and lightning arrestors, front connected cords instead of rear connected and units secured by knurled screws instead of machine screws. Models of the new design were made but due to the large stock of the older design on hand, were not submitted for service trials. Recently they have received such trials with the result that two of the three supposed improvements incorporated have been unfavorably received and a compromise design apparently will result. The operator's unit (also an A. E. F. recommendation) designed for use with these switchboards will probably also be abandoned and recourse had to the original plan of using a field telephone for the operator's set. A proposal that the switchboards be supplied normally

with cable attached and terminated on a terminal strip has met favor and the next model will be submitted for trial in that form.

FIRE CONTROL SYSTEM FOR FORTIFICATIONS—For several years the Coast Artillery Board has been active in investigation of fire control communication systems in fortifications to make them more nearly comparable in service rendered with modern commercial telephone practice. The chief difficulty lay in the fact that although the common battery telephone system was quite adequate at the time it was installed in fortifications, the constantly increasing range of armament has made it necessary in many cases to extend base line to a point where common battery transmission is no longer feasible. Some other features of the system are also susceptible of improvement, chiefly the telephone head sets, the time interval systems, and provision for emergency operation. There is little doubt but that the improvements in mind can be readily attained but the installation of a demonstration system is considered desirable if not essential before definitely adopting any new type. A fortification affording opportunity for the effective demonstration of the improved type is being sought, and upon final determination of the site, the installation of the model system can proceed.

SIGNAL PANELS—A Board of Officers convened by War Department Order has recently been studying the subject of identification and signal panels for use of headquarters in the field in communicating with aircraft. Many different codes for this purpose have been worked up independently by organizations in the field and this Board was created to determine the best system which might be generally used. As the result of this Board's work, which has recently received the approval of the War Department, it became necessary to revise in several respects, existing specifications for panels not only in color but in shape. That work is now under way.

SOUND RANGING FOR NAVAL TARGETS—At the close of the world war the Coast Artillery took over from the Navy Department a project, looking toward the development of a method for locating underwater craft which for any reason could not be seen from shore, by under-water sound detection. The Coast Artillery continued this work, first at Boston and later at Fort H. G. Wright, New York, until 1921; when the Signal Corps was charged with the technical development and the Coast Artillery continued with the tactical development. The two branches have since that date cooperated in the work at Fort H. G. Wright, New York. Two distinct uses for this equipment are in mind: First—as an aid to spotting and adjusting our own Artillery fire; Second—as a means for continuously tracking Naval targets under way. Encouraging results have been obtained in the use of this apparatus but its development cannot be considered to be completed. A new design of hydrophone station and shore compensator are under way which it is expected will materially improve the value of this equipment.

SCR-136 SET—This is the last of three aircraft sets and two ground sets for air to ground communication and vice versa which the Air Service and Artillery asked be developed about four years ago. It is a ground set having means for telephone, interrupted C. W., and pure C. W. transmission and reception. The range by telephone from ground to plane is 30 miles. A gas engine driven generator is the source of transmitter power supply. The development is practically complete and a model is receiving its final laboratory tests before submission for service tests.

UNI-DIRECTIONAL RECEIVER FOR PERMANENT RADIO STATIONS—The constantly increasing number of radio stations in daily operation for traffic and the definitely limited number of working frequencies available for assignment to such stations, makes it increasingly difficult to operate such stations without undue interference from other stations. Some relief will result if a receiver can be developed which will be responsive to radio energy coming from one direction only, excluding it from all other directions. Preliminary investigation indicates the possibility of developing such apparatus and following detailed study of the subject, a model of such a receiver is under construction. This apparatus will be limited in its application for the present, to permanent radio stations of the army net.

IMPROVED PORTABLE STORAGE BATTERY—The increasing use of moulded rubber containers for portable storage batteries used for automobile and radio work has suggested the possibility of using them to advantage for all field operations of the army. A limited number of such batteries using the elements of the BB-28 type were recently made up for us by a manufacturer and have been examined and made the basis of reports by the Signal Corps, Field Artillery and Coast Artillery Boards. The consensus of opinion was that the batteries were superior to the standard BB-28 type in that both weight and space were reduced together with probable lower maintenance by avoiding the destructive action of acid on the former wood containers. The design of detachable cover furnished and some other details were not acceptable. Additional batteries incorporating most of the detailed recommendations of the Boards will be obtained in the near future and again submitted to all Service Boards for report.

RADIO EQUIPMENT FOR MINE PLANTERS AND HARBOR VESSELS—The vessels of the Coast Artillery used in harbor defense are still equipped with spark transmitters. It is recognized that these are now obsolete and the Coast Artillery Board has recently outlined a program concurred in by the Signal Corps for the ultimate replacement of all its radio equipment with modern continuous wave equipment. The program includes mine planters, cable ships, harbor tugs and D. B. boats. Two different types of transmitters have already been furnished the Coast Artillery Board to determine their suitability on mine planters and cable ships. These were not thoroughly satisfactory and a third more promising type is now being obtained for that purpose. It is planned to use the SCR-109 A set on harbor tugs and also as a telephone set on mine planters. A trial will shortly be made of the SCR-133 set on a D. B. boat. This set was designed for aircraft use and is already in production. With slight alterations it is believed suitable for D. B. boats also.

RADIO FOR DIVISION NET. (15 MILES)—It is proposed to develop a set similar to the SCR-131 but having three times its range. This would normally be used between brigade and division headquarters and between certain larger headquarters of Artillery units. Its design has not yet been undertaken but it is contemplated to copy as nearly as possible the design of the SCR-131 in order that the methods of operation may be similar and the training problem thereby minimized.

PORTABLE ANTENNA SYSTEM FOR SCR-132 SET. Many forms of portable field antenna and supports therefor have been considered for use with the SCR-132 set, and several have been erected for trial. It has been finally decided to use an 80 foot metal mast supporting an umbrella antenna, the mast being of a new design which is assembled on the ground and raised with the minimum amount of special

apparatus and few men. It has been found that four men are sufficient to assemble, raise and lower this mast and antenna in a reasonable length of time. It has not been definitely determined whether a steel mast or a duralumin mast will be employed. One of each type is being made for further examination and trial. The only advantage of the duralumin mast would be its lighter weight, which is a factor in transportation.

History Repeats

Lieutenant Commander O. C. Badger, United States Navy, writes in the May, 1925, issue of the United States Naval Institute Proceedings, a most interesting article on "The Application of Lessons of History on a National Problem of Today." He states that at the time of the invention of the torpedo Great Britain and France maintained the most powerful navies in the world and that its invention created great discussion in those countries as to its influence on future warfare. Monsieur M. G. Charmes, whose writings were published in all of the great national and daily periodicals of France, was convinced that the torpedo had doomed the warship. He wrote:

The torpedo will surely triumph over the ironclad, and modern fleets will be consigned to the Naval Museum of the Louvre by the revolution that torpedo warfare will bring about. Unquestionably armor has been vanquished not by the gun but by the torpedo."

In dealing a mortal blow to the ironclad the advent of the automobile torpedo at once puts an end to the race which has for many years, gone on between the ironclad and its guns."

His writings so influenced the French nation that they largely discontinued the construction of battleships and concentrated on torpedo boats. England, however, continued her building program and as a result maintained the unquestioned supremacy of the seas. The author states that in 1888 France possessed 134 torpedo boats and eight destroyers, without even threatening Britain's naval supremacy.

The author writes regarding the British efforts to offset the power of the torpedo: "Out of the British effort was originated the present day means of effecting protection against the torpedo craft. They provided sufficient torpedo boat destroyers to guard the fleet and, if opportunity offered, to launch an offensive torpedo attack. They altered the hull design of heavy ships, providing them with numerous bulkheads and compartments. They developed and provided a breech-loading, rapid fire gun capable of being easily, quickly and efficiently handled."

At another point in his discussion he states: "Controversies of national and international importance have arisen in modern times over the invention or development of the frigate, the steam ram, the torpedo boat and the submarine. In each case the ship-of-the-line has been doomed by mistaken enthusiasts for national defense nostrums. In each case important modifications and methods have resulted. But because each of the smaller weapons has been restricted by its own limitations, the capital ship has continued as the pinnacle of sea power," and "The French proponents of the torpedo, in their enthusiasm, refused to acknowledge the efficacy of any proposed means of defense against that weapon. Because they did not experiment, with equal diligence, on developing such defense, none satisfactory was evolved. This resulted in the torpedo appearing to be more invincible than was actually the case."

Through his discussion of the advent of the torpedo the author shows that the same type of controversy existed then as has existed recently over the powers and limitations of aircraft. In this regard he makes the following refreshing statement: "At the present time, in reference to the airplane, no one-sided development must be permitted to bring about a blinding effect on the possibilities of the future. After all, it is cheaper to build up the necessary means of defense during times of peace than to wait until the urgency of war imposes such requirements. If, after thorough and sincere trial, the national resources fail to produce adequate means of defense, then, and not until then, are we safe in committing the safety of the nation to the new weapon. For these reasons, when broad claims for strong offensive power are made by any class of enthusiasts these same enthusiasts fail in their duty if they do not seek to provide equally strong defensive power."

A Courageous Action

Major General Summerall, Commanding the Second Corps Area, has recently had published a General Order which reads as follows:

HEADQUARTERS SECOND CORPS AREA
Governors Island, New York

April 25, 1925.

General Orders
No. 15

The Commanding General desires to commend publically Second Lieutenant Saverio H. Savini, 7th Coast Artillery, for his unhesitating and courageous action in saving a child from drowning in the waters of Sandy Hook Bay at about 11:30 a. m., March 6, 1925.

Upon discovering that the three year old son of First Lieutenant E. W. Timberlake, 7th Coast Artillery, was drowning, Lieutenant Savini without hesitation ran about 200 yards to the waters' edge, removed only his overcoat and in full uniform plunged into the icy water. In the intense cold he swam out 90 yards to the child and through the drifting ice brought him safely to the shore, thereby exemplifying that courageous spirit which produces instant mental and physical response to a call of duty that has always distinguished the Army. Had it not been for Lieutenant Savini's prompt and unselfish act without regard to personal consequences the small child would undoubtedly have drowned.

The Commanding General considers this superb performance worthy of the high traditions of the Army, exhibiting a presence of mind, degree of self sacrifice and high courage that reflects great credit upon Lieutenant Savini as well as the Army, which is proud to number him as one of it and worthy of emulation.

This order will be read to the assembled troops at each post, camp and station at the first formation after receipt.

(201 AGO-Off. Div.)

By command of Major General SUMMERALL:

W. P. JACKSON,
Colonel, General Staff,
Chief of Staff.

OFFICIAL

L. S. CHAPPELEAR,
Lieut. Colonel, Adjutant General's Department,
Adjutant General.

MILITARY NOTES

furnished by

THE MILITARY INTELLIGENCE DIVISION, G. S.

Morocco

FRENCH AND SPANISH MILITARY ORGANIZATIONS--French and Spanish efforts towards the pacification of Morocco have been so featured in the newspapers for the past six months that it may be of interest to see just how each country has organized its forces to combat the warlike Riff tribes led by their capable leader Abd-el-Krim.

At present, Spain maintains four strongly garrisoned posts in her zone which stretches from the mouth of the Moulouya River, on the Mediterranean east to Melilla, to south of Larache on the Atlantic. These four posts are Melilla, Tetuan, and Ceuta on the Mediterranean and Larache.

The organization of the Spanish Colonial army in Morocco was published in Madrid on March 26, 1925, as follows:

<i>Resume, Spanish Troops</i>		<i>Officers</i>	<i>Men</i>	<i>Animals</i>
Infantry	_____	1,200	39,159	6,644
Cavalry	_____	159	3,523	2,858
Artillery	_____	333	10,380	4,257
Engineers	_____	186	7,347	1,369
Q. M. Corps	_____	73	3,301	1,931
Medical Department	_____	132	2,252	655
Veterinary	_____	73		
Chaplains	_____	33		
G. S. (Topographic, etc.)	_____		49	
Sea (Stevedores) Cos.	_____		488	
Aviation	_____	56	415	
<hr/>				
Totals	_____	2,245	66,914	17,714

In addition to the above, 381 officers and assimilated personnel from different Arms, and 63 clerks are also attached to the administration of the protectorate.

Native Troops

5 Groups of "Regulares."

Prescribed strength	<i>Officers</i>	<i>Enlisted</i>		
		<i>Inf.</i>	<i>Cav.</i>	<i>Animals</i>
5 Groups of "Mehal-la Jalifiana."	458	10,876	2,180	3,871
Strength: varying according to circumstances, but usually, from 500 to 1000 enlisted per group.				

When the organization of her permanent army in Morocco is completed, Spain will have about 65,000 Spanish troops and some 15,000 native troops in all.

It is interesting to note that Spain relies almost entirely on her own nationals for this trying military service, the proportion of native troops being about one to four Spaniards in the zone.

France, on the other hand, reverses this proportion in the Protectorate.

At the beginning of 1924, the strength of the Corps of Occupation in Morocco was about 65,000 men. This comprised 55,000 men of the regular forces as follows: 43 Battalions of Infantry; 16 Squadrons (really troops) of Cavalry; 2 Squadrons of Cavalry Armoured Cars; 22 Batteries of Artillery; 10 Air Squadrons.

Of the above only 7 of the 43 Battalions of Infantry were French Battalions, and, of the 7 French, 4 were Zouave, which really serve only as depots for the instruction of the French noncommissioned personnel of the native troops. They do no fighting. The other three French battalions are the African battalions, penal battalions, which may serve only in Africa. Of the remaining 36 battalions, 9 are Foreign Legion and 27 are natives—Moroccan, Algerian, Tunisian and Senegalese—but all Regular Army.

The other 10,000 men are included in one of three distinct categories: 1—Mixed Goums of Morocco; 2—Maghzen, Mehallas of the region of Marrekech; 3—Partisans.

There are also being organized two Saharan companies. These native troops are peculiar to Morocco. The Goums were formed to circumvent the Treaty of Algeciras by the terms of which Germany would have claimed France was usurping the authority of the Sultan if she had raised regular troops as she had done in Algeria. They were local police forces which, in reality, rendered the same service as did regular troops and did it so well that even with the German mortgage lifted, and in spite of the consequent enlistment of Moroccan spahis and riflemen, the mixed Goums have been retained. There are now 27 of them—each consisting of three-quarters of infantry and one-quarter cavalry, officered by French officers of the Information Service and with French or experienced natives of the regular army as noncommissioned officers. Unlike the other irregular troops, they wear in part French army uniform, notably breeches.

The Maghzen are permanent troops of infantry and cavalry under the orders of the officers of the Information Service. Their strength, never very great, varies according to the posts and regions where they are employed. Unlike the Goums, they have no French officers or N. C. O.'s, and obey directly a native leader. Their job is to assure the police and security of the post to which they are assigned, to make patrols and to protect convoys and escorts.

The Mehallas are semi-permanent forces of infantry and cavalry, with no French officers or N. C. O.'s, which are recruited when needed by the great Caids of the South (Marrakech) under the control of the officers of the Information Service. They are all that remains of the Moroccan armies of former times.

The Partisans, on the other hand, are in no way permanent, but are the horsemen and foot-soldiers of the friendly tribes who volunteer to take part in any determined military action during a comparatively short period. For this they receive a daily pay, a rifle and some cartridges. In combat they are directed by the particular officer of the Information Service who is assigned to their tribe.

The difficulties of the operations in Morocco can be visualized by quoting from an account given by an officer on the Staff of the French Resident General, Marshal Lyautey:

"Our first contacts with the natives were decisive, great hordes coming out, at the call of a marabout, from the most distant tribes, confident in his power to

annihilate us and counteract any effort of our arms, hurling themselves in dense masses against our cannon and machine-guns. At Djorf, in 1903, at Sidi-Bou-Athmane in 1912, while General Mangin was marching on Marrekech, the victory was immediate and complete.

"Those happy days have passed!"

"The Berbers now know the force of our arms; they have, in a marvelous manner, applied their manner of fighting to their own warlike habits and to the terrain which they are defending.

"As to their warlike qualities, an absolute disregard for danger, alertness, physical vigor, as well as a surprising ability to maneuver on all kinds of terrain, an instinctive knowledge of surprise attack, cleverness in discovering the weaknesses of the adversary and in taking immediate advantage of them, are some of the most manifest. Their contempt for danger, warlike zeal—all who have served in Morocco can testify to these qualities.

"Their physical vigor is most extraordinary under all circumstances; whether their faces are torn by the 'siroco' and burning sand, as was true at Skoura in 1918, or whether it be a raging snow-blizzard lashing their half-naked bodies, as through the bitter night of the 'Aouinettes' in 1913, or yet being beaten down by the hailstones of such an icy deluge as was experienced at Bou-Arfa last May. The endurance of the 'Djicheurs' in descending the slopes of the Atlas in the heat of summer to scour the Sahara seems a feat almost supernatural to us of the civilized but more anemic races.

"Their ability to operate on any terrain is almost unbelievable. In 1913 at Ras Amras, a guard detachment which had just completed an hour's hard climb to the peak it had been ordered to occupy, observed the Chleuhs down in the valley and continued to fortify themselves rather at their ease, thinking they had an hour to spare; a quarter of an hour afterward they were attacked in hand to hand conflict by those same Chleuhs!

"From his early childhood the chief ambition of the young Berber is to become strong and artful. This is most natural, for he learns early in youth, from observation of his surroundings, that life for him will be one perpetual struggle for the 'survival of the fittest'—night and day the Berber stands guard against his hostile neighbor of the neighboring tribe. Thus, he follows his father and brothers to the hunt—even to war; very young he rides horseback; at the first opportunity he buys a rifle—or more probably, steals one—the very folk songs chanted by the women of the tribe at night under the tents impress deeply into his mind that he can not be worthy of being called a man until his exploits and acts of bravery and valor shall have been recognized and chanted by the women-folk, as they are now singing the deeds of his ancestors. In the eyes of the Chleuhs, the action of theft under arms is an accomplishment worthy of great honor, admiration and esteem; so the young Berber longs and seeks the first chance to try his skill. He soon takes part in one of the customery undertakings of his tribe, known as the 'rezzou,' organized to annoy the neighboring tribe, or still another operation known as the 'djich,' the motive of which is to take by surprise the French trains, labor parties or other small detachments. This innate thirst for plunder is one primary reason why the French recognize the advisability, in order to get along peaceably with the Chleuhs, of respecting the lands of these unruly tribes. Unless such a policy were adopted, a continuous attack by night and day by hordes of them would result; the French posts, convoys and communications would be in constant danger.

"In spite of all this, these incorrigible thieves seem to have a character which contains certain noble traits. For instance, they observe scrupulously certain

time-honored traditions—and, strange to say, keep their word. They have a clear understanding of the rules of hospitality which they respect warm-heartedly. If we go back to the early part of the Middle Ages, we will discover curious resemblances, even in looks, between these mountaineers of the Moroccan Atlas and the men who have become the world's models of chivalry.

"But let us follow the fortunes of a force which, with the object of taking over new territory, proposes to build an advanced camp. The enemy spies give the alarm. In a flash fires are kindled calling out the warriors who rush from their 'douars'; the foot-soldiers jump into the saddles with the cavalrymen or hang onto the tails of the horses; far back in the mountains, the sound of our cannon will bring out the others; it is the 'Call to Arms.' In a short time a curtain of sharp-shooters is formed; up on the crests, at the mouths of the ravines, they hide themselves awaiting the coming of the advance guard. The sun, the dust and the winter tempest have given to the clothing and skin of these fighters the very color of the ground they are defending—and they seem to melt into it. Woe to the band of invaders that is too weak or too dispersed, or which arrives out of breath or in disorder and dares to venture beyond the protection of its neighbors or out of sight of its artillery—in a flash the alarm announces their approach and, from all sides, the war-cry of the Berber rings out: 'Aoura, Aoura!' (Come on! Come on!)—and, out of tiny ravines, out from behind every imaginable shelter, the assailants filter down upon their victims with almost unbelievable rapidity. A few seconds and the firing begins, becoming more and more intense and close up, until it comes to a hand-to-hand conflict.

"But the signal has likewise been given to the French forces, and artillery shells and machine-gun bullets rain down on the enemy, who disappear at once as rapidly as they had appeared, carrying off their wounded and their dead—but also a quantity of French arms and munitions. Sometimes the line drawing back gives up a little ground in so doing, but not without continuing the firing, until the terrain is sufficiently favorable to warrant a counter-attack which they undertake in fury.

"It is against the flanks of a moving detachment, and to the rear, that they find their best opportunity to make trouble, so consequently most of them go in that direction. They come in swarms to harass the flank-guards; a summit is scarcely evacuated by the last echelon before it is covered by the sharp-shooters who have been, up to this moment, dispersed around about, all in spite of a veritable shower of shells. Having been so scattered about in the bushes and behind rocks, no definite objective was offered to the artillery, whereas the sharp-shooters, once having thus gained the summit and profiting by the facilities of adjusting their range, snipe off the cavalrymen and the infantry platoons still in movement. Everywhere the instant a vacant position is spotted, they swarm in to encircle it, taking advantage of every natural vantage point, and gradually coming nearer to their coveted prey, the main guard slowly moving along down in the valley below.

"And if, by chance, the French column reverses its direction of march, if, in any way, the new direction which they may have taken can be construed by their desperate assailants as a retreat, their warlike fury reaches a degree hard to comprehend. Their attack becomes really maddening; urged on by the shrieking of their womenfolk, all of them, even any who before may have been somewhat hesitant, appear all around the horizon; onward, through the rain of machine-gun fire and shells they rush, wedging in and out through the underbrush and rocks until they are right up onto the French units already hampered by

having to carry their dead, whom they must preserve from mutilation, and their wounded whom they must save. In 1914, at El Herri, an entire French column was thus almost totally annihilated.

"Once the French, despite all of this, have reached their objective, and have proceeded to set up camp, the assailants lose no time in harassing them by constant fire while they are digging their trenches or erecting their shelters. This accomplished, they post a number of guards to spy over the French while the rest retire to the 'douar' to eat, care for their wounded, admire the trophies they have won, and boast to the women of the tribe of the valor of their exploits. For this they do not lack an audience, their women being indeed numerous—real vixens, active, shrewd and warlike, having themselves followed up the men in battle to cheer them on, offer them drink, rob the enemy dead and wounded, as well as to lend a hand in carrying off their own dead, honor forbidding that they be left to lie on the field. They are constantly on the watch during the conflict to detect any sign of cowardice on the part of one of their men, which, if discovered—an event most rare—makes them use every effort to cover him with ignominy and shame.

"At dusk the most stubborn fighters return—they attempt no longer to attack the camps themselves, too well defended by a network of barbed wire, illuminated by torches and well flanked by automatic weapons, but they send in heavy volleys and often kill or wound quite a number of men and animals. Others are bold enough even to creep under the wire and strangle a sentinel or to cut the strap attaching the rifle to the wrist of a soldier asleep in his tent, making away with the weapon despite the violent fusillade loosed after them.

"The following days, native posts and lookouts are established; these spy unceasingly every movement of the French from all sides, holding themselves ready to take advantage of the slightest inattention on the part of the French, to spring down on their convoys, their labor parties, animals at water, etc. In France one too often hears officers expressing astonishment over the size of the losses: 'how can this be possible, when you consider that we are fighting with cannon and machine-guns against an enemy equipped only with rifles?' they say. They forget that, when a moving column has operated during an entire day on an almost impossible terrain, playing the role of a 'bull tormented by wasps,' it is not surprising if, at nightfall, a goodly number of stings have been received."

Japan

MILITARY TRAINING BEGINS IN JAPAN'S PUBLIC SCHOOLS—In April, 1925, the Japanese Official Gazette published the Students Preliminary Military Training Act together with the Joint Order of the Departments of War and Education giving rules for putting this Act into immediate effect.

This brings to a successful consummation the efforts of the officials of the Japanese War Department to place army officers in the higher grades of the public schools to enforce drill among the students. There is no doubt that the example of the Reserve Officers Training Corps in the United States to some extent influenced the Japanese War Department. The passage of the Army Reform Bill in the last session of the Diet, whereby four regular divisions are abolished, provides the funds necessary as well as supplies the officers for enforcing this training. While several hundred Japanese officers, chiefly in the higher grades, will probably be forcibly retired, about 1200 of the company and field ranks will be detailed as instructors in the public schools.

In the Japanese school system the elementary school extends over the first six years. The next five years' work is logically covered in the middle school, and this is followed by a three years' course in high school before reaching the college or university. However, above the elementary school, are numerous normal, technical and business schools attended by many students who do not go to the regular middle or high schools.

In the year 1920-1921 there were 10,435,000 students in Japanese schools. Of these about 8,633,000 were in the elementary schools and 70,000 in the colleges and universities. An examination of the new law, in the light of statistics, indicates that probably about 400,000 male students generally between fourteen and twenty-two years of age, will be compelled to take military training in the schools and about 170,000 more may voluntarily do so.

Article I of the new Students' Training Act reads as follows: "In order to take charge of the drill of the male students in the following *public* schools, Military Officers on the Active List will be attached to the following institutions: Normal Schools; Middle Schools; Business Schools; High Schools; Technical Schools; College Preparatory Schools; Middle School Instructors' Training Schools; Higher Normal Schools; Business School-teachers Training Schools; and Supplementary Business School-teachers Training Schools.

"The service may be omitted in time of war, in time of emergencies, or under any other unavoidable circumstances.

"The assignment of military officers as specified in the preceding article will be decided at conferences between the Minister of War and the Minister of Education. The military officers attached to the foregoing institutions will receive instruction from the principals of the schools concerned in regard to the training of the students."

Article 2 reads as follows: "In order to take charge of the drill of the male students in the following *private* schools, military officers on the Active List *may be* attached to each institution on *application*. Middle Schools; Business Schools; High Schools; College Preparatory Schools; Technical Schools; Other private schools especially officially recognized.

"Article 1 will apply to the case where military officers are attached in accordance with Article 2.

"Military officers on the Active List *may be* attached to different *colleges* in accordance with the preceding two provisions, on application."

One article provides for inspections of the training by army officers under orders of the Minister of War and another limits the application in business schools to those whose graduates have the equivalent of eleven years' schooling.

Under the Joint Order of the Departments of War and Education, the form of application for training by private schools is prescribed, and the cancellation of this training directed when the standing of the school is not officially recognized or when training indicates unsatisfactory results.

As yet the War Department has not made known how much credit is to be given the students taking military training in the schools when they are called to the colors.

REDUCTION OF NUMBER OF DIVISIONS—The Japanese Official Gazette under date of April 8, 1925, announces the new station list of the Japanese Army which will hereafter apply. As a part of the Army Reform Program approved at the last session of the Diet, four complete divisions, each of two infantry brigades of two regiments each, a field artillery regiment, a cavalry regiment, an engineer battalion, and a transport battalion have thus been abolished. At the same time

16 regimental district headquarters, four garrison hospitals and one remount unit are given up.

This should affect the number of officers and men serving with the colors by about 35,000. The actual reduction however, will hardly be as great. Among about 1900 officers affected, it is reported that at least 1200 of the company and field officers' grades are to be used in introducing military training in the public schools above the elementary grade and in certain private schools.

Increases in the services of aviation, antiaircraft, tanks, etc., will within the next few years, require from 300 to 500 additional officers. Many of these will be obtained by retaining in service officers who would otherwise be discharged. Undoubtedly a number of extra officers can be used with the units remaining and the actual reduction in officer personnel will not exceed a few hundred, chiefly in the field and general grades.

Under the present programs for increases in aviation, antiaircraft and tanks, it seems probable that about 5000 enlisted men will be added to the Japanese Army during the coming five years. For the present, however, only a thousand or so of the 33,000 taken from the divisions are liable to be retained in service. Thus the actual numerical reduction in the present Japanese active army is only a little over 30,000 officers and men.

In selecting the divisions to be eliminated, the Japanese War Department was confronted with considerable political pressure on the part of Diet members from the areas most likely to be affected. However, the final selection and adjustment shows rare judgment, and careful consideration of historical and hence morale conditions, as well as shifting of population.

The Japanese Active Army in the war with Russia had a 13-division organization. Following this war a program of reorganization was started and completed about 1908 whereby the Japanese Army consisted of 19 divisions, 18 being territorial, and the Guards divisions. The present two divisions for Korea were authorized in 1916.

In the present shift the division for Korea (19th and 20th) remain unchanged. The four to be eliminated from the six created following the war with Russia and leaves 14 territorial and the Guards division in Japan. Of these 15 home divisions, only four—the Guards and 1st Divisions of Tokyo, the 4th Division of Osaka and the 7th Division of Hokkaido are unaffected. The remaining eleven division changes are generally made by abolishing the newest regiments and replacing them by the regiments in these divisions at the time of the war with Russia which had been given later to the four divisions now eliminated. Thus the 2nd, 3rd, 5th, 8th, 9th, and 10th divisions, after nearly twenty years of change, now have the same regiments with which they fought Japan's major war and the changes in the other five divisions, two of which were created since the war with Russia, are as slight as possible.

The four divisions given up (the 13th, 15th, 17th and 18th) are all rural divisions, thus showing evidence of the distinct city movement of population in Japan in the past twenty years. The 13th (Takata) Division was stationed in territory bordering on the Sea of Japan. The 15th (Toyohashi) Division was stationed between Tokyo and Nagoya. The 17th (Okayama) Division occupied a portion of the area between the Inland Sea and the Sea of Japan. The 18th (Kurume) Division was one of three divisions stationed on the Island of Kyushu.

The two youngest divisions not to be abandoned are the 14th (Utsunomiya) Division occupying the region near but north of Tokyo and the 16th (Kyoto) Division stationed in and near Kyoto.

Undoubtedly the lessening of morale naturally expected as a result of so great a reduction and shifting in organization as has been here effected, is very slight, and the people and conscript soldiers will soon become accustomed to the changes made.

Italy

AIR STRENGTH OF POWERS—The Engineering Division of the Italian Air Service recently published the following comparative chart showing the air strength of France, Italy, the United States and Great Britain.

	Number of Planes						Grand Total	
	Airplanes			Seaplanes				
	Pursuit	Observation	Bombardment	Pursuit	Observation	Bombardment		
France	750 (50 sq.)	756 (63 sq.)	336 (28 sq.)	12 (1 sq.)	48 (4 sq.)	36 (3 sq.)	1938 (149 sq.) Appropriation 1924/25 820,000,000 Italian Lire =\$34,167,500.	
Italy 30/6/25	486 (27 sq.)	314 (24 sq.)	213 (22 sq.)	84 (6 sq.)	196 (14 sq.)	18 (3 sq.)	1311 (95 sq.) Appropriation 1924/25 500,000,000 Italian Lire =\$20,833,333.	
United States	201 (14 sq.)	320 (25 sq.)	162 (16 sq.)	99 (8 sq.)	111 (9 sq.)	105 (9 sq.)	998 (81 sq.) Appropriation 1924/25 1,920,000,000 Italian Lire =\$80,000,000.	
England	216 (17 sq.)	240 (20 sq.)	153 (15 sq.)	54 (4 sq.)	77 (6 sq.)	15 (2 sq.)	755 (64 sq.) Appropriation 1924/25 1,800,000,000 Italian Lire =\$75,000,000.	



COAST ARTILLERY BOARD NOTES

Communications relating to the development or improvement in methods or materiel for the Coast Artillery will be welcome from any member of the Corps or of the service at large. These communications, with models or drawings of devices proposed, may be sent direct to the Coast Artillery Board, Fort Monroe, Virginia, and will receive careful consideration.—R. S. ABERNETHY, Colonel, C. A. C., President Coast Artillery Board.

New Projects Initiated During the Month of May

Project No. 345, Gray Antiaircraft Machine Gun Sight—This sight is being developed by the Ordnance Department. When manufactured, one each of the Cal. .30 and Cal. .50 sights will be sent to the Coast Artillery Board for test.

Project No. 346, Information of Recent Developments in Methods and Materiel (Sound Ranging)—This project is confidential and will not be published.

Project No. 347, Cowen Graphic Method of Fire Adjustment—A rapid graphic method of fire adjustment by means of a master chart and grids. Submitted by 1st Lieut. Edward G. Cowen, 92nd Coast Artillery, and now being tested by the 51st Coast Artillery at Fort Eustis, Va., under the supervision of the Coast Artillery Board.

Project No. 348, Test of Compasses—Referred to the Coast Artillery Board for study and recommendations with reference to standardization upon two types of compasses only, and the characteristics desired in each type. The Board in its report recommended standardization upon two types only—a cheap type for issue to certain Coast Artillery personnel serving with mobile artillery for route finding in marching, or preliminary reconnaissance. As a rule, this type is not required by Coast Artillery personnel assigned to fixed harbor defense and antiaircraft batteries. The accurate compass to be of the prismatic type for use as indicated in Paragraphs 1-6, T. R. 435-325. The recommendations of the Coast Artillery Board were approved by the Chief of Coast Artillery.

Project No. 349, Hearn Ballistic Computer—This device was proposed by Captain (now Colonel) Clint C. Hearn, Coast Artillery Corps, in 1904. At that time it was recommended by the Artillery Board that an allotment of funds be made for the construction of one of the devices and that it be sent to Fort Monroe for test. The Commanding Officer, Frankford Arsenal, on February 7, 1905, submitted an estimate to the Chief of Ordnance covering the cost of manufacture of the device—\$1044.60. The Artillery Board in its proceedings of March 17, 1905, stated, "If each instrument is to cost this amount (\$1044.60) the Artillery Board is of the opinion that the value of the instrument does not justify the expenditure. If single instruments after the first can be constructed at a reason-

able cost, say approximately \$125.00, it is thought advisable to complete the first one for test, and the Board recommends, in such case, that the additional allotment be made." Available records show no further action taken in the matter until March 19, 1925, when a letter was written by Colonel Hearn suggesting that the subject be reopened at this time. The matter was accordingly referred to the Coast Artillery Board for consideration and report.

The Coast Artillery Board has studied the device and among other conclusions drawn decided "That the military value of the device did not warrant its manufacture." The report of the Board has received the approval of the Chief of Coast Artillery.

Project No. 350, Supply of Fire Control Charts and Equipment—This is a continuing project and covers the supply of charts (blue prints and brown prints) by the Coast Artillery Board to Coast Defenses, mobile artillery regiments, National Guard Coast Artillery organizations, Reserve Officers Training Corps Units of Coast Artillery.

Project No. 351, Firing Lanyard for 16-inch Howitzer Carriage Model 1920—Firing lanyard for the 16-inch howitzers at Fort Story installed, tested, and found satisfactory with minor modifications.

Project No. 352, Rectangular Coordinate Method of Fire Control—Method proposed by Lieutenant William D. Hohenthal, C. A. C. Under study by the Coast Artillery Board in connection with Project No. 86—"Rectangular Coordinate Slide Rule (Helmer)."

Project No. 353, Study of Antiaircraft Target Practice Reports Panama Coast Artillery District, 1923-1924—Being studied by the Coast Artillery Board, special attention being given to the following:

- a. The reporting of aerial spots by "Polar Coordinates."
- b. The value of "Fire Adjustment Boards."
- c. The separation of "Corrections of the Moment" from "Muzzle Velocity Corrections."

Project No. 354, Test of 3-inch Antiaircraft Gun Sighting System—Test to be made on both the 1917 MI gun and the 1923 E gun.

Completed Projects

Project No. 327, Conditions of Fire at High Speed Targets

I—HISTORY OF THE PROJECT.

1. In connection with the present development of position finding and fire control the Coast Artillery believes it desirable, so far as may be practicable, to calculate the effect of the approximate assumptions and methods used in position finding upon the accuracy of the firing data when applied to targets moving at 25 and 30 knots.

2. To present this situation broadly, several different directions of travel have been considered, that is, in direction of plane of fire, at 30° to plane of fire, at 45° and at 60° .

3. The arms considered were the 16-inch barbette rifle, the 14-inch rifle, the 12-inch mortar and the 12-inch rifle on barbette carriage, model of 1917. Case II and Case III firing were considered for guns. These are considered at several different elevations.

4. The erroneous assumptions usually applied in service are the following:

a. On plotting board; time of flight for predicted travel of target taken to correspond to last setforward point.

b. On range correction board; Ruler set at map range of last preceding set forward point.

- (1) Flat correction in yards.
- (2) Correction in per cent.

c. On deflection board: Use of corrected range of last preceding setforward point. **NOTE:** This is usually necessary because present practice is to use corrected range instead of map range as deflection board argument. The question as to whether corrected or map range should be used in computing deflection corrections and time of flight for travel will be taken up in another project.

II—COMPUTATIONS.

5. a. (Table A)

TABLE A
PLOTTING BOARD ERRORS.

Speed of Target = 30 Knots
= 1013 Yds. p. Min. }
Travel in 30 Sec. = 500 Yards. }
 } 16" Gun—Proj. 2340 (3/4 and Full charge).
 } 14" Gun—Proj. 1660
 } 12" Gun—Proj. 1070
 } 12" Mortar—Proj. 700 (Zone III[X—A])

Predicting Interval = 30 Sec.

Caliber	M. V. F.S.	Eleva- tion. Deg.	Time of Flight Differences for Successive Set Forward Points. ΔT.				Range Errors Due to Use of Wrong Time of Flight. Yds.				Deflection Error Due to Use of Wrong Time of Flight. Yds.			
			Inclination of Track to Plane of Fire.				Inclination of Track to Plane of Fire.				Inclination of Track to Plane of Fire.			
			0°	30°	45°	60°	0°	30°	45°	60°	0°	30°	45°	60°
16" R	2190	45	6.8	6.2	5.5	4.4	113	89	65	36	0	51	65	62
	2700	45	4.5	3.9	3.3	2.5	75	56	39	21	0	32	39	35
14" R	2150	20	1.5	1.3	1.1	0.8	25	19	12	6	0	11	12	12
	2350	20	1.5	1.3	1.1	0.8	25	19	13	6	0	11	13	12
12" R	2250	35	2.7	2.4	1.9	1.4	45	34	23	12	0	20	23	20
12" M	635	45	5.6	4.9	4.5	3.7	94	71	53	31	0	41	53	53
	1800	45	5.4	5.0	4.3	3.3	89	72	51	27	0	41	51	48
16" R	2190	20	1.3	1.1	0.9	0.7	22	16	12	6	0	9	11	10
	2700	20	1.0	0.9	0.7	0.5	17	13	8	4	0	7	8	7
14" R	2150	10	1.1	1.0	0.8	0.6	18	14	9	5	0	8	9	9
	2350	10	1.0	0.9	0.7	0.5	17	13	8	4	0	7	8	7
12" R	2250	10	1.1	1.0	0.8	0.6	20	14	9	5	0	8	9	9
12" M	635	58° 33'	2.1	1.8	1.5	1.1	35	26	18	9	0	15	18	16
	1800	60	0.5	0.4	0.4	0.3	8	6	5	2	0	3	5	4
	1800	55	2.6	2.3	1.8	1.3	43	32	21	10	0	19	21	19

b. It will be seen from the foregoing that range and deflection errors which should not be neglected result from the practice of computing travel to setforward point with the time of flight for last setforward point.

6. a. (Table B)

TABLE B
RANGE BOARD—PERCENTAGE CORRECTION—YARDS

Caliber	M.V. F.S.	Eleva- tion	Change in Correction Due to Target Travel of 500 yds. Using Percentage of Last Preceding Set Forward Point—Yards.									
			-150 F.S. change in M.V. 0° incl.	M. V.				Atmosphere				
				2/3 Max. Variation (100 F.S.)				2/3 Max. Variation (10.6%)				
				Inclination of Track				Inclination of Track				
			0°	30°	45°	60°		0°	30°	45°	60°	
16" R	2190	45	52	35	30	25	18	29	19	16	13	10
	2700	45	49	34	29	24	17	33	22	19	16	11
14" R	2150	20	52	35	30	25	18	28	19	16	13	10
	2350	20	46	31	27	22	16	32	21	18	15	11
12" R	2250	35	44	29	25	21	15	35	23	20	16	12
12" M	635	45	203	135	117	95	68	6	4	3	3	2
	1800	45	44	29	25	21	15	32	21	18	15	11
16" R	2190	20	54	36	31	26	18	28	19	16	13	10
	2700	20	44	29	25	21	15	29	19	16	13	10
14" R	2150	10	56	37	32	26	19	19	13	12	9	7
	2350	10	51	34	29	24	17	33	22	19	16	11
12" R	2250	10	54	36	31	26	18	20	13	17	9	7
12" M	635	58-35	203	135	117	95	68	7	5	4	4	3
	1800	60	44	29	25	21	15	35	23	20	16	12
12" M		55	203	135	117		68	7	5	4	4	3
		55	44	29	25	21	15	34	23	20	16	12

b. (Table C)

c. (Table D)

d. (Table E)

e. It appears here that as a rule, except in the case of mortar fire, the separate errors with the range correction board due to setting ruler at range of last preceding setforward point are not often significant with correction either in percentage or in yards. In the case of the 12-inch mortar, the errors are negligible at no range when course of target diverges appreciably from normal to plane of fire.

f. A summation of possible errors from large M. V. and atmosphere corrections, (Table E) and a tabulation of values of ΔR indicates that the method of using last preceding time of flight in determining new travel is the source of the largest error, but that the total of errors due to setting of ruler of range board at range of last preceding setforward point may approximate 100 yards in amount. This suggests the desirability when travel in range is great, of providing for setting the ruler of range board at a range more closely approximating the actual range of new setforward point. It will be seen later that it is proposed to accomplish this by the same means that closer value of the time of flight is provided for.

7. a. (Table F)

TABLE C
BANGE BOARD EBBOB

30 Sec. Int. Speed 500 Yds. per 30 Sec. (Correction in Yards).

		M.V.						Atmosphere Density.					
Caliber	M.V. F.S.	-150 F.S. in M.V. 30 Sec.		Error due to use of last preceding Set F.P. Interval 30 Sec. 2/3			Max. Variation (100 F.S.)	+16% change in At. Den.		Error due to use of last preceding Set F.P. Interval 30 Sec. 2/3			
		Ele- vate- tion	Int. 0°	Incl.	Inclination of Track	Int. 0°		Int. 0°	Incl.	Inclination of Track	Int. 0°	Incl.	
					0° 30° 45° 60°					0° 30° 45° 60°			
16" R	2190	45	21	14	12	10	7	4	3	3	2	2	
	2700	45	76	51	44	36	26	5	3	3	2	2	
14" R	2150	20	39	26	23	18	13	44	30	26	21	15	
	2350	20	34	23	20	16	12	54	36	31	25	18	
12" R	2250	35	27	18	15	13	9	56	37	32	26	19	
12" M	635	45	201	134	116	95	67	5	3	3	2	2	
	1800	45	21	14	13	10	7	16	11	10	8	6	
16" R	2190	20	47	31	27	22	16	42	28	24	20	14	
	2700	20	43	29	25	20	15	45	30	26	21	15	
14" R	2150	10	45	30	26	21	15	37	25	22	18	13	
	2350	10	42	28	24	20	14	42	28	24	20	14	
12" R	2250	10	43	29	25	20	15	41	27	23	19	14	
12" M	635	58°35'	185	123	106	87	62	2	2	2	1	1	
	1800	60	56	38	33	27	19	25	17	15	12	9	

TABLE D
SUM OF ERRORS—PERCENTAGE CORRECTION
Range: For Dif. in Time, M. V. and Atmosphere.
Range—Incl. of

Range - in ch. 0							
Caliber	16'' R	14'' R	12'' R	12'' M			
M. V.	2190	2700	2150	2350	2250	Zone	
Elevation	45	45	20	20	35	III	X-A
ΔR, M.V. (True)	(a)	21	76	39	34	27	201
ΔR, M.V. (R. Bd. in %)	(b)	52	49	52	46	44	203
ΔR, Atmos.	(c)	4	5	44	54	56	44
ΔR, Atmos. %	(d)	29	33	28	32	35	16. M.V. = -150 f.s.
Errors.							AT = ×16%.
ΔR, Plot. Bd.		113	75	25	25	45	94
ΔR, M.V. (b-a)		31	27	13	12	17	23
ΔR, Atmos. (d-c)		25	28	16	22	21	16
Sum—Yds.	169	130	54	59	83	103	128
Sum—% of R	0.52	0.27	0.27	0.26	0.31	2.63	0.72
Elevation	20	20	10	10	10	55	55
ΔR, M.V. (True)	(a)	47	43	45	42	43	198
ΔR, M.V. (R. Bd. %)	(b)	54	44	56	51	54	203
ΔR, Atmos. (True)	(c)	42	45	37	42	41	49
ΔR, Atmos. (R. Bd. %)	(d)	28	29	19	33	20	44
Errors, using R. Bd. in %							
ΔR, Plot. Bd.		22	17	18	17	20	43
ΔR, M.V. (b-a)		7	1	11	9	11	23
ΔR, ATM. (d-c).		14	16	18	9	21	5
Sum—Yds.	43	34	37	36	52	53	37
Sum—% of R.	0.19	0.10	0.29	0.25	0.39	1.46	0.22

TABLE E

SUM OF ERRORS—YDS.—FLAT CORRECTION

Range: For Dif. in Time, M.V. and At. Den.—Yds. and %.
 Deflection: For Dif. in Time, Wind, Drift—Degrees.

Range—0° Inclination.

Caliber	16"	14"	12"	12"	Zone	
	R	R	R	M	III	X-A
M.V.	2190	2700	2150	2350	2250	
Elevation	45	45	20	20	35	45
ΔR, Plotting Board	113	75	25	25	45	94
ΔR, M. V.	21	76	39	34	27	201
ΔR, Atmosphere	4	5	44	54	56	5
Sum, Yds.	138	156	108	113	128	300
Sum, %, of R.	0.42	0.32	0.43	0.50	0.44	7.68
						Atmosphere Den.
Elevation	20	20	10	10	10	55
ΔR, Plotting Board	22	17	18	17	20	43
ΔR, M.V.	47	43	45	42	43	198
ΔR, Atmosphere	42	45	37	42	41	1
Sum, Yds.	111	103	100	101	104	242
Sum, % of R.	0.49	0.32	0.79	0.69	0.79	6.70
						0.58

DEFLECTION—45° INCLINATION.

Elevation	45	45	20	20	35	45	45
ΔD, Plotting Bd.	0.12	0.05	0.03	0.03	0.06	0.77	0.16
ΔD, Wind	0.04	0.01	0.02	0.01	0.02	0.28	0.12
ΔD, Drift	0.18	0.11	0.03	0.03	0.05	1.35	0.74
Sum—Degrees	0.34	0.17	0.08	0.07	0.13	2.40	1.02
Elevation	20	20	10	10	10	55	55
ΔD, Plotting Bd.	0.03	0.01	0.04	0.03	0.04	0.34	0.05
ΔD, Wind	0.01	0.01	0.01	0.01	0.02	0.26	0.10
ΔD, Drift	0.01	0.01	0.02	0.01	0.01	1.29	0.22
Sum—Degrees.	0.05	0.03	0.07	0.05	0.07	1.83	0.37

b. From the foregoing it appears that errors in drift computation using range of last preceding setforward point may be significant while wind effects will have appreciable errors in the case of the 12-inch mortar only.

8. Similar computations in the case of the 16-inch howitzer will, in the case of elevations above 45 degrees, give results similar to those for mortars.

III—DISCUSSION.

9. From an examination of the tables in Section II, it appears that the ordinary fire control methods applicable to targets moving at low speeds require modification to secure the desired accuracy in the case of high speed targets.

These requirements are:

a. That a time of flight corresponding as closely as possible to the range of the new setforward point be used in computing travel to that setforward point.

b. That range board ruler be set at or near range of the setforward point for which range corrections are to be computed.

c. That range used as argument with deflection board be range of actual (latest) setforward point.

d. That sight deflection for travel of target in azimuth, whether measured by gun pointer or computed on deflection board, be based on time of flight corresponding to range of actual (latest) setforward point.

TABLE F

DEFLECTION BOARD ERROR—DEGREES.

30 Sec. Int. Speed: 500 Yds. per 30 Sec.

Caliber	M.V. F.S.	Eleva- tion	Drift				50 M.P.H. Wind			
			Error due to use of Last Preceding Set F. P. Interval, 30 Sec.				Error due to use of Last Set F. P. Interval, 30 Sec.			
			Inclination of Track				Inclination of Track			
			0°	30°	45°	60°	0°	30°	45°	60°
16" R	2190	45	0.21	0.20	0.18	0.13	0.05	0.04	0.04	0.03
	2700	45	0.15	0.14	0.11	0.08	0.01	0.01	0.01	0.01
14" R	2150	20	0.03	0.03	0.03	0.02	0.03	0.03	0.02	0.02
	2350	20	0.05	0.04	0.03	0.02	0.02	0.02	0.01	0.01
12" R	2250	35	0.06	0.06	0.05	0.03	0.03	0.03	0.02	0.02
12" M	635	45	1.80	1.59	1.35	1.02	0.40	0.35	0.28	0.20
	1800	45	1.01	0.90	0.74	0.58	0.17	0.15	0.12	0.09
16" R	2190	20	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
	2700	20	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
14" R	2150	10	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01
	2350	10	0.02	0.02	0.01	0.01	0.02	0.02	0.01	0.01
12" R	2250	10	0.01	0.01	0.01	0.01	0.03	0.03	0.02	0.02
12" M	635	58° 35'	2.14	1.85	1.52	1.07	0.27	0.24	0.19	0.14
	1800	60	0.34	0.30	0.24	0.17	0.12	0.11	0.09	0.06
12" M	635	55	1.91	1.50	1.29	.84	0.28	0.24	0.20	0.14
	1800	55	0.44	.39	.22	.21	0.15	0.13	0.10	0.08

(1) This together with comprehension of the amount of the deflection correction for travel indicates that the travel correction should be computed in the plotting room and not measured by the gun pointer.

(2) The question as to whether map range or corrected range should be used as deflection board argument need not be considered here.

10. The method of meeting the foregoing requirements described below is proposed as the result of a study almost entirely theoretical. Practical solution of this problem can result only from test of service. It follows that practice in firing a high speed target is highly desirable. Since an actual high speed target cannot be had for practice, it appears advisable:

- a. To fire at purely hypothetical target.
- b. To use sub-caliber target with reduced scale to simulate high speed target (if practicable).
- c. To have fire control drill with commercial or naval vessels moving at high speed whenever practicable.
- d. To use high speed targets with minature ranges.

11. The following method of solving the problem is proposed for test:

- a. Figure 1 represents a sheet of cross section paper for use as range time board with special variations as indicated. It will be noted that in addition to the vertical time lines numbered 1, 2, 3, 4, etc., there are curves numbered III, IV, etc. (Curves I and II are omitted for clearness). These curves may be graduated in times of flight. The curve III is constructed by measuring from time line 3 to the right a distance for any range (as indicated on vertical scale)

measured by the time of flight for that range. From this it follows that times on curve III represent for any range the time of splash of a projectile fired at time 3.

b. If a range time relation curve be plotted on observations at time 1 and 2 and prolonged to curve III, the intersection will give an approximate value of the range to the setforward point for prediction 30 seconds ahead of time 2.

c. After prediction starts, since ranges to setforward points only are read by plotter, time range relation is plotted from setforward points each on its proper time curve as read, and predictions made as desired.

d. This form of prediction can be used to obtain:

(1) Time of flight based on preliminary prediction of actual range of setforward point.

(2) Approximate range for setting of range board ruler.

(3) Approximate range from which preliminary computation of corrected range may be made for the purpose of using corrected range (if this be prescribed) in computing azimuth or deflection corrections and time of flight.

e. The time range device shown is complete in itself and is separate from the travel correcting device shown in the right hand part of the board and to be described later.

f. In case of a howitzer, gun, or mortar using a number of zones this board will be complicated by the necessity of having curves for different zones drawn in colors.

g. This small drawing indicates only the method of solution of the problem. It may be seen that it will probably be necessary to construct a chart which can be mounted on rulers and turned under a celluloid or xylonite plate upon which the time range relation curve may be drawn.

h. In general, the operation of this time range relation device provides simply for a preliminary prediction of the approximate range for one setforward point ahead of the one for which the actual range has been read by the plotter.

i. The right hand portion of the diagram is a simple travel computing device and is inserted for the purpose of indicating that the man who performs the duty of travel computer in the plotting room can operate the time range relation device as well. This travel computing device is so constructed that the reading on the ruler at its intersection with the curve numbered to correspond to the travel in 30 seconds called by the plotter will give the travel in 30 seconds plus the time of flight.

(1) In case of guns or mortars using several charges the right hand chart would be constructed for times of flight rather than ranges.

(2) If corrected ranges are to be used in computing travel then the ruler for this chart would be read at the preliminary corrected range instead of the map range of the setforward point.

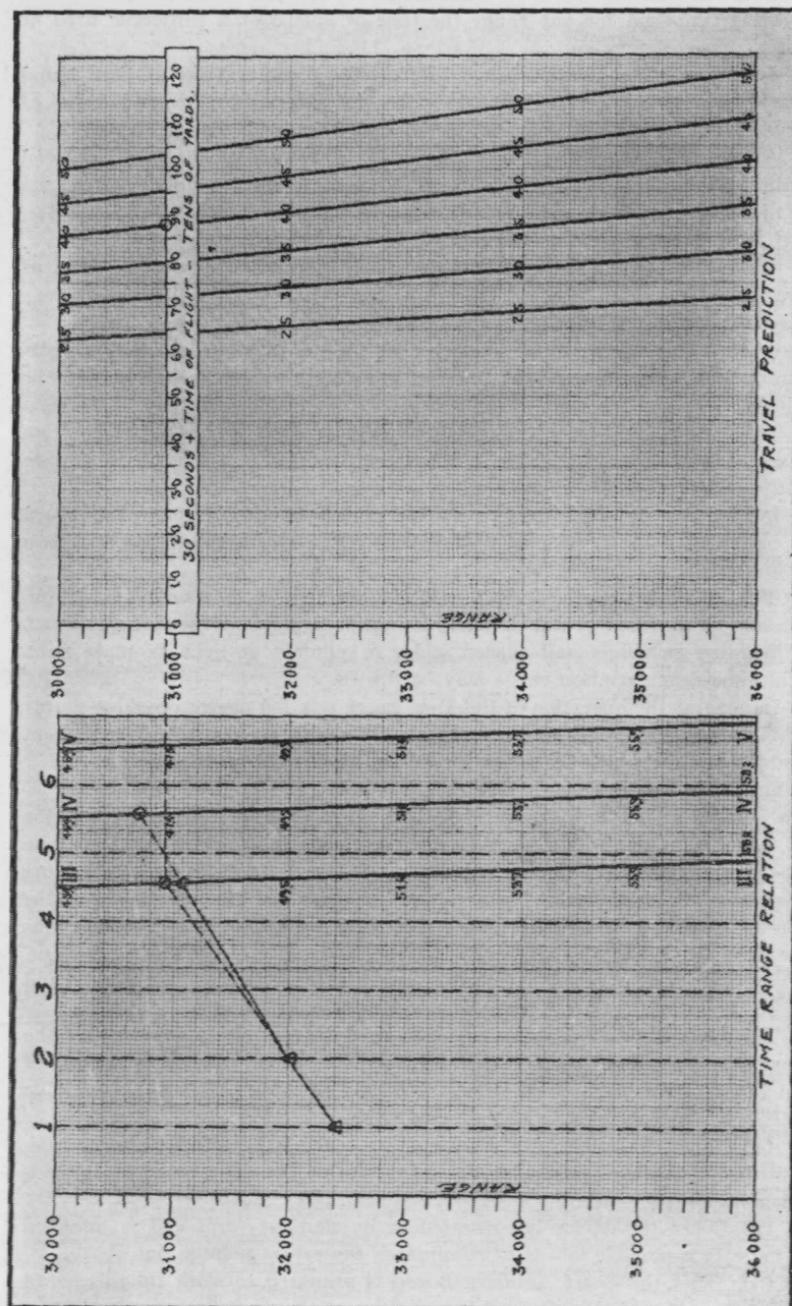
j. It is to be noted:

(1) That the range prediction on this board is intended to be preliminary and in no sense to replace the determination of the map range of the setforward point by the plotter.

(2) That the device is presented in its simplest form and is intended only to indicate a possible means of eliminating the errors pointed out above.

(3) That the Coast Artillery Board is prepared to work up this board in operable form should it be desired to make use of the device for service test at a particular battery.

(4) That this solution as offered is one and not the only possible solution.



12. The proposed predicting device suggests a possible solution of some of the problems in connection with fire at high speed targets. It requires an additional man to operate it only in those plotting rooms where a separate range computer has been dispensed with.

13. Service test of this and other methods for improving the accuracy of fire control methods in the case of high speed targets is desired.

IV—RECOMMENDATIONS.

14. It is recommended:

a. That steps be taken to bring to the attention of the Coast Artillery service the special conditions for fire at high speed targets.

b. That fire control methods not applicable to high speed targets be not permitted for regular drill or practice with any moving target.

c. That arrangements be made for at least one practice per year in each active coast defense command at high speed hypothetical target.

d. That in case it is desired to assign particular batteries to the development of methods of fire control the Coast Artillery Board be instructed to communicate directly with those batteries and to furnish to them devices similar to those described in paragraph 10.

ACTION BY CHIEF OF COAST ARTILLERY.

The following is the action taken by the Chief of Coast Artillery on this project:

First Indorsement

War Department, O. C. C. A., April 7, 1925—To the President, Coast Artillery Board, (through Commanding General 3d Coast Artillery District) Ft. Monroe, Va.

1. This project has been given careful consideration and while this office concurs in the views of the Coast Artillery Board as to the desirability of developing fire control methods suitable for accurate plotting of high speed targets, it is deemed advisable at present to take the following action on the recommendations contained in Section IV:—

a. There is no objection to the publication of this project in the COAST ARTILLERY JOURNAL so long as the action indicated in this indorsement is also published.

b. Until such time as a better system may be developed and tested, the present fire control methods will be used.

c. It is not considered practicable at this time to require each Coast Defense Command to conduct firings at high speed hypothetical targets.

d. If, at a later date, it becomes practicable to assign a particular battery to test the devices described in this project, the Coast Artillery Board will be so informed and authorized to assist in the test.

BOOK REVIEWS

The Campaign in Mesopotamia (Volumes I and II). Compiled under the direction of the Historical Section of the Committee of Imperial Defense by Brigadier General F. J. Moberly, C. B., C. S. I., D. S. O., p. s. c., His Majesty's Stationery Office, London, 1924. Per volume \$3.00.

These two volumes cover the operations in Mesopotamia to include the surrender of General Townshend at Kut-el-Amarah, April 29, 1916. The maps and sketches are clear and complete. Included in Volume II is a short story of the experience of the British and Indian in captivity, and acknowledgment of the services on their behalf of United States Ambassadors Morgenthau and Elkins, and Netherlands Minister de Willebois.

Because of the necessity of explaining fully everything that occurred in connection with each operation in Mesopotamia and particularly with General Townshend's ill fated advance on Baghdad, copious extracts of the correspondence between the Imperial Cabinet and War Office, the Indian Government, and the Commanders in Mesopotamia are included. It is laborious reading, but the reader will be amply repaid.

Primarily the operations in Mesopotamia had three main objects; the protection of British interests in the Persian Gulf, the protection of the oil works at Abadan with the pipe line to the Anglo-Persian oil fields, and the support of friendly Arabs, particularly the tribes of the Shaikhs of Mohamerah, Nonh, and of Kurvait west of the Persian Gulf.

How the Commanders of the British force were led to extend their operations along the Tigris and to attempt with insufficient force and entirely inadequate transport, the capture of Baghdad is related in full detail. It appears that the Imperial Cabinet, The Indian Government, and the Commander in Chief in Mesopotamia all really favored the advance on Baghdad, but none wished to assume responsibility. Marshal Kitchener and General Townshend, who was destined to command the expedition, seem wholeheartedly to have opposed it.

There is no lack of detail of the military operations, and a full statement of the reasons why General Townshend permitted himself to be invested at Kut. The reviewer finds these reasons inadequate, but it is only fair to point out that Townshend had in Kut two months supplies which he would have been unable to take with him on a retreat beyond that point, and that should the Turks have been able to pin him down further southward and then surround him, he could not have held out so long.

Up to the investment of Kut the British operations had been strategically unsound because of their disregard of the consequences of a tactical defeat or even of a failure of complete success. While bold to recklessness, tactically these operations seem to have been well adapted to the object.

But the operations for the relief of Kut illustrate almost every conceivable tactical blunder. Time after time all chance of tactical success is lost by premature withdrawal from action. Coordination of offensive action is nearly always lacking.

It will be news to many readers that in the attacks on the Dujoila redoubt March 8, 1916 (50 days before the surrender) two British divisions were within eight miles of Townshend's position at Kut, and that the Turks who were in inferior numbers here were on the verge of withdrawing. Here as elsewhere, the partial attacks were not coordinated but were made successively so as to derive no advantage from each other. It is difficult to conceive the possibility of so much confusion as existed in the British command here. And it can be said that here is one of the most glaring examples in military history of failure because of the retention by the supreme commander of the control of minor operations. The reviewer believes a detailed study of this action will repay any military student.

The two volumes invite the reader to draw conclusions. For example, one feels that the British Commanders failed completely to take account of the defensive qualities of the Turks by which the latter were enabled to besiege Kut, and repulse all attempts at relief. This and the fact that the Turks were nowhere successful offensively should have been decisive arguments against Townshend's stop at Kut. And it seems particularly unfortunate that the British Commander-in-Chief in Mesopotamia, in the earlier operations (Nixon) should have been somewhat over aggressive when caution appears to have been advisable, while his successor (Lake) was inclined to caution when boldness was essential to the relief of Kut.

It is expected that the subsequent volumes of this history will be no less interesting and illuminating than these two.—R. S. A.

The Constitution of the United States. By James M. Beck, LL. D. George H. Doran Co., New York, 1924. 6"x9". 362 pp. \$2.50.

President Coolidge says in the Foreword "It is of first importance that the study of the Constitution should be an essential part of the education of the American youth. * * * The Constitution is not self-perpetuating. If it is to survive, it will be because it has public support. * * * To live under the American Constitution is the greatest political privilege that was ever accorded to the human race."

The author, who, in addition to having served as Solicitor-General of the United States, is an officer of the Legion of Honor, and Honorary Bencher, Gray's Inn, London, has undoubtedly spent much time in the preparation of this work. It shows the results of extensive study and painstaking research. This book had its origin in five lectures which the author delivered in the Hall of Gray's Inn, London, during 1922 and 1923. The lectures were subsequently published as such in New York, London, and Paris. Since there seemed to be a continuing demand, the author decided to rewrite the book entirely by eliminating the lecture form and adding considerable material. This trebled the contents of the book. This is the new work and in it he has endeavored to include all available material relating to the making of the Constitution.

The history of the making of the Constitution is most interesting and instructive. The following extracts, taken chronologically from the book, will give an idea of the manner in which the subject is treated:

"The Constitution has its roots in the great and heroic past of the English speaking race."

"The spirit of the framers of the Constitution was less emotional and more practical than that which inspired the Declaration of Independence."

In discussing the chaotic state of the country during the last days of the Confederation the views of several eminent men of the times are given. Washington wrote to George Mason at the time:

"I have seen without despondency, even for a moment, the hours which America has styled its gloomy ones, but I have beheld no day since the commencement of hostilities that I thought our liberties in such imminent danger as at present. Indeed, we are verging so fast to destruction that I am feeling that sense to which I have been a stranger until within these three months."

In speaking of the great convention, the author remarks:

"Now follows a notable and yet little known scene in the drama of history. It reveals a people who, without shedding a drop of blood, calmly and deliberately abolished one government, substituted another, and erected it upon foundations which have hitherto proved enduring. Even the superstructure slowly erected upon these foundations has suffered little change in the most changing period of the world's history. There have been but few additions and, except for the Amendments immediately following the Civil War, only the most recent additions have made notable changes from the plans of the original architects. The Constitution is today, not a ruined Parthenon, but rather as one of those Gothic masterpieces, against which the storms of passionate strife have beaten in vain. The foundations were laid at a time when disorder was rampant and anarchy widely prevalent."

Several delegates to the convention were late. Washington, on time as usual, remarked "These delays greatly impede public measures, and serve to sour the temper of the punctual members, who do not like to idle away their time."

Realizing that this was true, Franklin "invited all the delegates who had reached Philadelphia on May 16, 1787, to dine with him * * * knowing that a good dinner was often the solvent of many difficulties." One chapter of the book is devoted to a most interesting description of the dinner and the guests who attended.

The discussion of the preliminaries to the convention takes up another chapter of the book and in concluding his remarks the author states that "To George Washington, soldier and statesman, is due above all men the ideal of a federated union, for without his influence—that of a trusted and unselfish leader—the great result would probably never have been secured. While still waiting for the convention to meet, and while discussing what was expedient and practicable when they did meet, Washington one day said to a group of delegates, who were considering the acute nature of the crisis:

"It is too probable that no plan that we propose will be adopted. Perhaps another dreadful conflict is to be sustained. If, to please the people, we offer what we ourselves disapprove, how can we afterwards defend our work? Let us raise a standard to which the wise and just can repair. The event is in the hand of God."

Notable words, worthy of acceptance in all times and in all nations, and it was in this spirit that the convention finally convened on May 25, 1787."

Under the headings of "The Opening of the Convention," "Opening of the Battle," "Mr. Hamilton Takes the Floor," "Nearing the Crisis," "The Crisis," "The Dawn," "The Convention Witnesses a Great Experiment," "Nearing the End," and "The Curtain Falls" the author takes the reader through the Convention as far as available records will permit. The relation is apparently com-

plete. The most astonishing thing in the narrative is the fact that, despite the gentlemanly arguments and intense discussions of the convention, there was no word spoken outside of the convention regarding their work and no one other than the delegates themselves had any idea of what they were doing during the four months they were in session. When the convention adjourned to permit the delegates to witness John Fitch's experiment "Little the Framers of the Constitution could appreciate on that 22nd of August, 1787, that an epoch that had lasted for many centuries, the pastoral-agricultural age of mankind, was then forever passing and that a new epoch of mechanical power, amplified a thousand-fold more than their utmost imagining, was about to begin." The signing by the delegates was not done without hesitancy on the part of some. "Many delegates had left in disgust and the fifty-five had shrunk to forty-two. Of the latter three refused to the last to sign."

"The Ratification of the Constitution" gives an account of the difficulties encountered in the various states. Finally, in May, 1790, Rhode Island accepted it. "Thus again was completed the union of the thirteen States, this time in fact, as in name, "a more perfect union." Upon what a slender thread had hung the destinies of the United States! The vote of eighteen men would have certainly defeated the ratification of the Constitution. If ten Massachusetts delegates, six delegates of Virginia and two of New York had changed their votes, the noble work of the Philadelphia Convention would have come to naught. The United States would not, at least at that time, have come into existence, and its present Constitution, the admiration of the world, would have become waste paper, if, by a change of only eighteen votes the great States of Massachusetts, Virginia and New York had absented themselves from the "more perfect union."

Chapter XVI covers "The Political Philosophy of the Constitution."

"The Basic Principles of the Constitution" listed below are then taken up and each of them is discussed. The author lists them as:

The first is representative government.

The second and most novel principle of the Constitution is its dual form of government.

The third principle was the guaranty of individual liberty through constitutional limitations.

Closely allied to this doctrine of limited governmental powers, even by a majority, is the fourth principle of an independent judiciary.

Possibly no provision of the Constitution is of greater interest to the publicists of other nations than this unique tribunal (The Supreme Court).

The sixth basic principle of the Constitution seeks to prevent the concentration of power in any one man or body of men by a complex system of checks and balances.

The joint power of the President and Senate in the determination of the foreign policies of the United States.

One chapter is devoted to "The Constitution and America's Foreign Relations," while another "A Century Later" pictures the Centennial Anniversary of the Constitution held in Philadelphia in 1887.

Under the heading "A Rising or a Setting Sun" the author pictures the tendency of modern times. "Unless the American people awaken to the necessity of defending their most priceless heritage, there is manifest danger that within the lives of those now living the form will survive the substance of the faith."

In "The Decay of Leadership" the author agrees with Cicero "Such as are the leading men of the State, such is the State itself" and with Lord Bryce when he said "The proportion of men of intellect and social eminence who enter public life is much smaller in America than in each of the free countries of Europe."

"Of all the phenomena which have resulted from the age of the machine, the most striking is the revolt against authority, and by authority is meant not only the laws of the State, which are the least important, but the great laws of social life and the conventions and traditions of the past."

"Work for work's sake, as the privilege of human faculties, has largely gone, both as an ideal and as a potent spirit, with millions of men."

"When that parchment was last taken from the safe in the State Department, the ink, in which it had been engrossed nearly one hundred and thirty-seven years ago, was found to have faded.

"All who believe in constitutional government must hope that this is not a portentious symbol. The American people must write the compact, not with ink upon parchment, but with "letters of living light"—to use Webster's phrase—upon their hearts."

Again the solemn warning of the wise men of old suggests itself:

"Where there is no vision, the people perish; but he that keepeth the law, happy is he."

The six appendices give: The Virginia Plan; The New Jersey Plan; The Constitution of the United States; Macauley's Correspondence with Randall; Washington's Appeal; Miscellaneous Notes.

Well written and extremely interesting, this book would be a most valuable addition to every American's library.—H. B. H.

The Profession of Arms. By Elbridge Colby. D. Appleton and Company, N. Y.
5" x 7". 183 pp. \$1.50.

The author, Sometime Proudfoot Fellow in Letters, Columbia University and now a Captain of Infantry, is well known to the Army as a contributor to various service publications.

The purpose of the book as stated in the preface "is simply to represent the Army, its motives, its work, its sacrifices and satisfactions, to the young men of the country."

This book is of interest to all members of one of the oldest of professions—the Profession of Arms—and is of value to all who would know more about a profession to which every citizen of this country may be called at any time; and is invaluable to those who may consider entering the profession permanently.

If this little book dispels some of the misconceptions about the Army, the author will have rendered a distinct service to his country for an understanding by the citizenry of the Army is of importance to our National Defense.—R. V. C.

William Crawford Gorgas. By Marie D. Gorgas and Burton J. Hendricks.
Doubleday Page and Co., Garden City, N. Y. 6½" x 9". 359 pp. \$5.00.

This work, while an extremely entertaining and interesting book, loses some of its value to the history student, due to the fact that the authors' view point is a little too close. In some instances they err on the side of caution in not giving full credit to General Gorgas especially in certain controversies which he had with his superiors during the building of the canal. However, the book is good reading from start to finish, and due to the same close point of view, we learn many things of General Gorgas' life and character, which no other biographer could give us.

One fact of especial interest, is that it was his desire to enter the regular army, which determined General Gorgas to study medicine. Failing in his efforts

to obtain an appointment to West Point, medicine seemed to be the door by which he could enter. And so we see the young southerner, starting out as a medical student always with the idea in mind that some day it might win him a commission in the Army.

General Gorgas' life seems to have been crossed by the yellow fever path from the very beginning. It was during a yellow fever scare that his mother and father met, and it was while they were both ill with the fever, that General Gorgas, then a junior medical officer, met the future Mrs. Gorgas. Then came his detail to work with Walter Reed in Cuba to try and stop the frightful tool of deaths from the plague. All credit for the discovery of the means of contagion are given to Reed, but it was Gorgas who evolved the system of eradicating the mosquitos, and teaching the Cubans what a menace a small can of water could be to an entire community.

This part of the book is extremely well done, as are also the chapters on the sanitation of the Panama Canal. If General Gorgas had only done these two things in his life, civilization would still owe him an incalculable debt. But even after his health was failing, he kept on, declining to delegate his work to others, until death came to him as he was on his way to find the last stronghold of his enemy.

Other biographies of General Gorgas will be written, but this one will be unique in showing the lovable character of the man himself and his utter devotion to his duty and his country.—L. B.

The Fruit of the Family Tree. By Albert Edward Wiggam. The Bobbs-Merrill Company, Indianapolis, 1924. Illustrated. 6" x 9". \$3.00.

The author is a popular lecturer and writer on scientific subjects. He has attempted, and with success, to dramatize for the average reader the present day knowledge on heredity and its relationship to human progress.

The writer shows that not only races vary in character and intelligence but human breeds vary. That there are strains of blood that by wise marriages have produced a large per cent of the leaders of the world.

There is much valuable information in this book which will be taught some day in schools and colleges more generally than is done at present.

Some of the subjects discussed are: Does Blood Tell? Is Brain-Power Inherited? Does Heredity or Environment Make Men? What Twins Tell About Heredity. What Cousin Marriages Tell About Heredity. The Truth About Prenatal Influences. Measuring Heredity in Royalty. Birth Control. Does Science Know the Mechanical Means of Heredity by which Virtue and Vice, Intelligence and Stupidity are Transmitted from Parent to Child.

Here is a book not only worth reading but worthy of a place in the home library.—W. W. I.

Talking Well. A Book on the Art of Conversation, by W. L. Harrington and M. G. Fulton. The MacMillan Company, New York. 5" x 7 $\frac{1}{4}$ ". 196 pp. \$1.40.

This small book is filled with valuable suggestions and lessons for those who wish to develop or improve their conversational English. It should prove to be of considerable help also to those who aspire to public speaking or whose duties require frequent, or even occasional, addresses in public.

The principal subjects covered are Essentials of Good Conversation, Story Telling, Advice on Voice Improvement, Sales Talks, Reading or Recitation, Platform Manners and Delivery, and Colloquial English.—R. D.

Atoms and Electrons. By J. W. N. Sullivan. George H. Doran Company, New York, 1924. 4½" x 7". 188 pp. \$1.25.

This is a clear, interesting and concise statement of the great advance that has been made in recent years toward discovery of the fundamental laws of the constitution of matter and energy. It is a book excellently adapted to its avowed purpose. It brings to the Modern Readers' Bookshelf ("for the humanizing of knowledge") such an authoritative presentation of the main gist of modern science as should strongly appeal to the intelligent reader.

Treating of a highly technical subject and appealing to a popular audience is always a matter for compromise. In the present instance the author has rightly counted on sufficient eagerness after knowledge on the part of his readers to carry them through a period of concentration and studious thought to the glorious revelation that the human mind is able to weigh to the trillion-trillionth of an ounce, measure the space within an atom, and arrange the varied phenomena of X-ray and ultra-violet spectra in logical order. Let no one with sluggish imagination expect to find delight in following the intricacies of such tremendously minute beings as electrons are shown to be, or in keeping pace with such prodigious velocities as they are said to possess.

After an introductory chapter on units and notation, the book reviews hastily the atomic and molecular theories which have underlain the science of chemistry for some years. Thence we are led on to the belief that atoms are not after all indivisible, but are built up, all from the same material—and that that material is electricity. Succeeding chapters are occupied in showing in greater detail just how the complicated structure of atoms is composed, citing a variety of experiments in substantiation of the hypotheses advanced, and drawing conclusions explainable in the light of such beliefs.

That these conclusions are by no means dogmatic,—a goal arrived at,—but that vast new fields are just beginning to open out to a vista of intellectual progress, is the most inspiring spirit of this little book.—P. H. F.

